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Proceedings of the United States National Museum

United States National Museum, Smithsonian
Institution, United States. Dept. of the Interior

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UNITED STATES NATIONAL MUSEUM

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The scientific publications of the National Museum consist of two series—Proceedings and Bulletins.

The Proceedings, the first volume of which was issued in 1878, are intended primarily as a medium for the publication of original papers based on the collections of the National Museum, setting forth newly acquired facts in biology, anthropology, and geology derived therefrom, or containing descriptions of new forms and revisions of limited groups. A volume is issued annually or oftener for distribution to libraries and scientific establishments, and, in view of the importance of the more prompt dissemination of new facts, a limited edition of each paper is printed in pamphlet form in advance. The dates at which these separate papers are published are recorded in the table of contents of the volume.

The present volume is the forty-second of this series.

The Bulletin, publication of which was begun in 1875, is a series of more elaborate papers, issued separately, and, like the Proceedings, based chiefly on the collections of the National Museum.

A quarto form of the Bulletin, known as the "Special Bulletin," has been adopted in a few instances in which a larger page was deemed indispensable.

Since 1902 the volumes of the series known as "Contributions from the National Herbarium," and containing papers relating to the botanical collections of the Museum, have been published as Bulletins.

RICHARD RATHBUN,

Assistant Secretary, Smithsonian Institution,

In charge of the United States National Museum.

DECEMBER 10, 1912.



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New species: <i>Apanteles</i> (<i>Apanteles</i>) <i>aristotelizæ</i> , <i>A.</i> (<i>A.</i>) <i>braunæ</i> , <i>A.</i> (<i>A.</i>) <i>epinotizæ</i> , <i>A.</i> (<i>A.</i>) <i>gelechizæ</i> , <i>A.</i> (<i>A.</i>) <i>lithocolletidis</i> , <i>A.</i> (<i>A.</i>) <i>plesius</i> , <i>A.</i> (<i>A.</i>) <i>polychrosidis</i> , <i>A.</i> (<i>A.</i>) <i>trachynotus</i> , <i>Ascogaster</i> <i>olethreuti</i> , <i>Cantharoctonus</i> <i>stramineus</i> , <i>Chelonus</i> (<i>Chelonella</i>) <i>buscki</i> , <i>C.</i> (<i>C.</i>) <i>ruficol-lis</i> , <i>C.</i> (<i>C.</i>) <i>townsendi</i> , <i>C.</i> (<i>Chelonus</i>) <i>chilensis</i> , <i>C.</i> (<i>C.</i>) <i>gossypii</i> , <i>Cyan-opterus</i> <i>depressi</i> , <i>C.</i> <i>peculiaris</i> , <i>C.</i> <i>steirastomæ</i> , <i>Eubadizon</i> <i>lithocolletidis</i> , <i>Eutrichopsis</i> <i>agromyzæ</i> , <i>Habrobracon</i> <i>johannseni</i> , <i>H.</i> <i>tetralophæ</i> ,	

¹ Date of publication.

Helcon castaneæ, *Macrocentrus cerasivoranz*, *Meteorus nipponensis*, *Microbracon vestitica*, *Perilitus epitricis*, *Apanteles* (*Protapanteles*) *feltæ*, *A. (P.) hesperidivorus*, *A. (P.) pyraustæ*, *A. (Pseudapanteles)* *choreuti*, *Spathius brunneri*, *Triaspis pissodis*, *T. vestitica*, *Zamicrodus sensilis*, *Campoplex* (*Angitia*) *hellulæ*, *Asternaulax fiski*, *Campoplex* (*Campoletidea*) *caradrinz*, *Casinaria scabriformis*, *Daictimorpha peruviana*, *Campoplex* (*Diadegma*) *japonicus*, *Ephialtes dolichosoma*, *Ezeristes nubilipennis*, *E. hyalinipennis*, *Campoplex* (*Hypothereutes*) *exiguæ*, *Idechthis patulus*, *Mesochorus trisulcatus*, *Mesostenus* (*Mesostenus*) *versicolor*, *Neogreenia picticornis*, *Paracarnidia elyi*, *Stilpus anthomyidi-perda*, *Trichomma epischniz*, *T. granitellæ*, *Zasternaulax simplicicornis*.

New subgenera: *Zelomorphidea*, *Campoletidea*, *Sesioplex*.

New names: *Chelonus szepligetii*, *Andrena saundersi*.

New variety: *Triaspis vestitica* var. *minutissimus*.

VIERECK, H. L. Descriptions of five new genera and twenty-six new species of Ichneumon-flies.—No. 1888. March 19, 1912¹ 139-153

New genera: *Aenoplegimorpha*, *Brachiziphosoma*, *Microtoridea*, *Neopimplioides*, *Zamesochorus*.

New species: *Apanteles* (*Apanteles*) *fumiferanz*, *A. (A.) prodeniz*, *A. (A.) taragamæ*, *A. (A.) tischeriz*, *Aphidius colemani*, *Meteorus arctiicida*, *M. trachynotus*, *Microbracon hyslopi*, *M. psilocorri*, *Apanteles* (*Protapanteles*) *colemani*, *A. (P.) creatonoti*, *A. (P.) cushmani*, *A. (P.) electræ*, *A. (P.) papilionis*, *A. (P.) stauropi*, *A. (Pseudapanteles)* *sesiz*, *Aenoplegimorpha phytonomi*, *Conoblasta fumiferanz*, *Phygadeuon* (*Dirophanes*) *plexius*, *Epiurus innominatus*, *Mesochorus diversicolor*, *Microtoridea lisonota*, *Monoblastus caliroæ*, *Neopimplioides syleptæ*, *Pristomerus euzopheræ*, *Zamesochorus orientalis*.

New names: *Hymenoepepneis*, *Hymenosyneches*.

WEED, ALFRED C. See under BEAN, BARTON A. 587-611

WILLIAMS, HENRY SHALER. Some new mollusca from the Silurian formations of Washington County, Maine.—No. 1908. July 3, 1912¹ 381-398

New genera: *Eurymyella*, *Cliopecteria*.

New species: *Eurymyella shaleri*, *E. angularis*, *E. simulans*, *E. plana*, *E. recta*, *E. conveza*, *E. denbowensis*, *Cliopecteria bicostrata*, *C. uniconsta*, *Pterinea lazata*, *Streptotrochus ione*, *S. regularis*, *S. carinatus*, *S. sulcatus*.

New varieties: *Eurymyella shaleri*, var. *breva*, *E. s.* var. *longa*, *E. s.* var. *minor*.

WILSON, CHARLES BRANCH. Descriptions of new species of parasitic copepods in the collections of the United States National Museum.—No. 1900. April 30, 1912¹ 233-243

New species: *Argulus ingens*, *Achtheinus pinguis*, *Lernanthropus lappaceus*.

¹ Date of publication.

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DESCRIPTIONS OF NEW HYMENOPTERA, NO. 4.

By J. C. CRAWFORD,

Associate Curator, Division of Insects, United States National Museum.

Many of the new species described in this paper are from a collection sent for determination by Mr. L. C. Coleman, entomologist to the Government of Mysore, India. The microhymenoptera of that region are practically unknown and most of the species sent by Mr. Coleman are new.

Superfamily PROCTOTRYPOIDEA.

TELENOMUS COMPEREI, new species.

Female.—Length, about 0.9 mm. Black, legs fulvous, coxæ black; scape and pedicel about the color of the legs, rest of antennæ dark brown; articulating joint at base of scape long, black; first joint of flagellum slightly longer than pedicel, the pedicel elongate; face finely rugulose, lower part of face finely, closely punctured; head thin antero-posteriorly, slightly wider than thorax; mesoscutum and scutellum rather coarsely reticulately rugulose; scutellum at apex with a single row of pits; metanotum covered by a single row of pits coarser than those on scutellum; first segment of abdomen at base with a row of pits, back of these, rugulæ, reaching to apex of segment; second segment about twice as wide as long, basally with a row of pits and back of this (except laterad) rugulæ reaching almost to apex of segment; following segments only showing slightly.

Male.—Length, about 0.9 mm. Similar to the female, pedicel short, antennæ fulvous (the apical joints missing).

Habitat.—Canton, China.

Type.—Cat. No. 14338, U.S.N.M.

Seven females and one male reared from the eggs of an unknown hemipteron by Mr. George Compere, after whom it is named.

The coarse sculpture of the mesonotum distinguishes this species from the other species of the genus described from the Orient.

TELENOMUS COLEMANI, new species.

Female.—Length, about 1.1 mm. Black, the antennæ brown, the legs testaceous, the coxæ black; face granular; head transverse; pedicel and first joint of funicle subequal, second joint longer than wide, the following joints subquadrate, the club six jointed; mesoscutum finely reticulately rugulose, scutellum indistinctly reticulated, more apparent along anterior margin, opaque; metanotum with a transverse row of pits; first abdominal segment rugose almost the entire length; second segment with a basal row of pits, back of these rugæ which medially extends half the length of the segment; second segment wider than long (as 18 : 13).

Male.—Length, about 1 mm., antennæ about 1 mm. Similar to the female, the antennæ testaceous, the pedicel almost globular, the first three segments of the funicle elongate, the following ones subquadrate; the apical one about as long as the first.

Habitat.—Hunsmanalli, Mysore, India.

Type.—Cat. No. 14339, U.S.N.M.

Five females and one male reared from the eggs of *Dolycoris indicus* and sent by Mr. L. C. Coleman (for whom it is named) under his number 136a.

HADRONOTUS FULVIVENTRIS, new species.

Female.—Length, about 1 mm. Head and thorax black, abdomen ferruginous, legs reddish testaceous, the coxæ and the front femora on basal two-thirds black; scape testaceous, the upper side medially brownish; rest of the antennæ reddish brown, the club more brown; pedicel slightly longer than first joint of funicle, following joints of funicle subquadrate; club 6-jointed, each subquadrate; face finely reticulated; mesoscutum finely rugulose, at rear medially becoming distinctly longitudinally so; scutellum longitudinally rugulose, at apex with a row of pits; metathorax with a row of pits and medially at apex with an elevated disk which is longitudinally rugulose; truncation of propodeum with rugulæ diverging from the center; mesopleuræ with a row of pits at front and one at rear, the rest of the surface rugulose; metapleuræ with a row of pits at front; marginal vein somewhat longer than pedicel of antennæ; stigmal almost twice as long as marginal; postmarginal over twice as long to stigmal; first abdominal segment with a row of pits at base, back of these, longitudinally striate, the apical margin smooth; second segment with a row of pits at base, back of this with fine reticulations, almost resembling shallow thimble-like punctures; broad apical margin of the second segment, smooth; following segments with similar punctures and broad smooth apical margins.

Male.—Length, about 1 mm. Similar to the female, but the abdomen black; antennæ, except scape, brown, the pedicel slightly

longer than the first joint of the funicle, the following joints subquadrate, the apical joint almost as long as the two preceding joints united; sculpture somewhat stronger than in female; middle and hind legs slightly suffused with brown toward base.

Habitat.—Bangalore, Mysore, India.

Three females and six males reared from the eggs of *Clavigralla gibbosa* and sent by Mr. Coleman under his number 129.

Type.—Cat. No. 14340, U.S.N.M.

Superfamily CHALCIDOIDEA.

Family AGAONIDÆ.

Genus EISENIELLA Ashmead.

Eiseniella ASHMEAD, Proc. Ent. Soc. Wash., vol. 8, 1906, p. 31. (New name for *Eisenia* Ashmead preoccupied.)

Secundiseenia SCHULZ, Spolia Hym., 1906, p. 146.

Allopade STRAND, Archiv. f. Naturgesch., vol. 77, 1911, Heft 1, p. 210.

Family TORYMIDÆ.

Tribe MEGASTIGMINI.

In the Proceedings of the Entomological Society of Washington (vol. 12, 1910, p. 93), I called attention to the fact that Dr. Gustav Mayr had long ago corrected the error in regard to the number of spurs on the hind tibiæ in this tribe, but that this correction had been ignored. A reexamination of specimens of the type-species of the genus *Megastigmus* determined by Doctor Mayr, as well as all other species of the genus examined by me, show two well-developed spurs on the hind tibiæ. As the tribe *Pulvilligerini* Strand was erected because of two apical spurs (and the supposed absence of one in the *Megastigmini*) it appears to be a synonym.

Tribe PODAGRIONINI.

PODAGRION GREENI, new species.

Female.—Length, 4 mm.; ovipositor, 8 mm. Head and thorax green, the latter more bronzy and posteriorly more bluish, closely punctured, on the lateral areas of mesonotum and axillæ becoming almost transverse striæ; posterior part of scutellum finely reticulated; antennæ testaceous, the club brown, without a ring joint (see fig. 1); the club greatly enlarged, with a flattened sensory area on one side, on the other, the sutures visible; mesepisternum above, punctured, below, together with the metapleuræ, reticulated; mesepimeron smooth; propodeum finely closely transversely striate, laterally



FIG. 1.—PODAGRION GREENI. ANTENNA OF FEMALE.

becoming almost thimblelike punctures; no median nor V-shaped carina on propodeum, but just cephalad of insertion of abdomen a semicircular carina surrounding the posterior area of propodeum; wings subhyaline, with a small infuscated stigmal spot; front and middle legs, including coxæ, testaceous; posterior coxæ bluish, elongate, subcylindrical, as long as their femora; hind femora and tibiæ brown, the tarsi testaceous; hind femora with about 9-10 teeth, two or three of them being mere tubercles; abdomen petiolate, the petiole almost half the length of the hind coxæ; abdomen brown, the base lighter, the petiole more reddish.

Male.—Length, 4 mm. Similar to the female, the antennæ entirely reddish testaceous; the thorax more greenish, the hind femora and tibiæ somewhat darker, the petiole shorter, the sculpture of the propodeum more like transverse rows of punctures.

Habitat.—Punduloya, Ceylon.

Five females and one male reared from egg capsule of *Mantis*, sp. by Mr. E. Ernest Green, after whom the species is named.

Type.—Cat. No. 14341, U.S.N.M.

PODAGRION KOEBELEI, new species.

Female.—Length, 4 mm.; ovipositor, 8 mm. Green, the venter testaceous; the antennæ brown, with a ring joint, the scape at base in front testaceous, the club not enlarged (see fig. 2); head and thorax closely punctured, the punctures on the median lobe of the mesoscutum thimblelike; those on the apical part of the scutellum finer than in the anterior part; lateral lobes of mesoscutum reticulated, along the inner margins almost transversely



FIG. 2.—PODAGRION KOEBELEI. ANTENNA OF FEMALE.

striate; propodeum punctured, with a median longitudinal carina which extends backward to about middle of propodeum where it divides each branch running laterad and slightly caudad; laterally these branches each join a longitudinal carina which extends from the apex of the propodeum almost to the anterior margin; back of the transverse carina are several irregular rugæ; coxæ, front and hind femora, except bases and apices, metallic; rest of legs reddish testaceous more or less suffused with brown; hind coxæ elongate, somewhat thickened basally; hind femora with about six teeth; mesepisternum punctured, upper section of mesepimeron faintly lineolate, lower section distinctly so; metapleuræ reticulately rugulose; abdomen subsessile.

Male.—Length about 2.5 mm. Very like the female except in secondary sexual characters.

Habitat.—Australia.

Many specimens reared from a mantid egg mass by Mr. Koebele (after whom the species is named) and with his note number 606, the note saying they came from South Australia.

Type.—Cat. No. 14342, U.S.N.M.

Differs from the description of *obscurus* Westwood in color and in the apex of the antennæ being concolorous with the rest, in the darker legs, etc., from that of *olenus* Walker in the dark antennæ and the color.

Specimens which I consider *olenus* Walker are without the lateral carinæ on the propodeum.

PODAGRION REPENS Metchulsky.

Female.—Head and mesonotum with shallow almost thimblelike punctures; mesopleuræ with similar punctures, the posterior half with finer ones; metapleuræ horizontally striate; propodeum with an inverted V-shaped carina, the surface with fine thimblelike punctures; posterior coxæ about as long as their femora, the basal end swollen; abdomen subsessile; antennæ with one ring joint and the club not greatly swollen.

The type consists of about 20 specimens on one card, and the above notes are from the type-material.

Family MISCOGASTERIDÆ.

Genus LELAPS (Haliday) Walker.

Laelaps DALLA TORRE, Cat. Hym., vol. 5, 1898, p. 184.

Dilaelaps SCHULZ, Spolia Hym., 1906, p. 144.

Stenopiethia STRAND, Societas Ent., vol. 25, 1910, p. 25.

The two original references to this genus are: Walker in Ann. and Mag. Nat. Hist., vol. 12, 1843, p. 47, and Haliday in Trans. Ent. Soc. Lond., vol. 3, pt. 4, p. 299, said to have been issued in 1843. However, on page 237 of that volume, there is a footnote dated July 14, 1844, and the receipt of part 4 was acknowledged by the Entomological Society of France at the meeting of September 10, 1845, so that this part must have been issued after July, 1844, and in all probability was not published until the beginning of the year 1845. It appears that the genus should be credited to Mr. F. Walker.

In both of these places the name is spelled *Lelaps*, and this spelling was changed to *Laelaps* by Dalla Torre. It is this latter spelling which is preoccupied, and the names proposed by Schulz and Strand are therefore unnecessary.

Family ENCYRTIDÆ.

ANASTATUS VUILLETI, new species.

Female.—Length 2.25 mm. Head varying shades of blue and green, thorax very dark blue-green, in some lights appearing black, or violaceous; abdomen aeneous; apical half of scape testaceous, the basal portion metallic; pedicel metallic green, rest of antennæ brown;

pedicel longer than joints 1-3 of funicle combined, these joints subquadrate; face as high as antennal fossa granular, above this shining, indistinctly sculptured; median lobe of mesoscutum, lateral lobes in part, axillæ and scutellum reticulated with fine impressed lines; scutellum at base with two triangular depressed areas (adventitious?); mesopleuræ and prepectus finely lineolated; femora green, tibiæ dark brown, anterior tibiæ in front and their tarsi testaceous; middle and hind tarsi at base as dark as their tibiæ; wings smoky, with hyaline bases and at apical half of marginal vein a hyaline area extending backward somewhat more than the length along marginal vein; on caudal margin of fore wing almost opposite this hyaline area, but slightly more toward apex of wing, another somewhat smaller hyaline spot; infuscation beyond end of marginal vein lighter than basad of this point; submarginal vein longer than the marginal and postmarginal combined; marginal vein somewhat longer than postmarginal, this in turn slightly longer than stigmal; abdomen finely reticulated with impressed lines.

Male.—Length about 2 mm. Similar to the female, the head and thorax green, the scape entirely testaceous, sculpture of face stronger, that above antennal fossa almost as strong as below, but more like reticulations; sculpture of mesonotum stronger than in female; wings with an infuscated spot covering stigmal vein and extending about half way across wing; near apex of submarginal vein a small indistinct infuscated spot; front and middle legs, including apices of coxæ, testaceous; front femora with a green stripe behind; front tibiæ, middle femora and middle tibiæ with a brown stripe behind; hind legs dark brown, the femora and tibiæ with a narrow testaceous stripe in front; first, fourth, and fifth joints of hind tarsi dark brown, joints 2 and 3, whitish.

Habitat.—Koulikoro, French Soudan, Africa.

Type.—Cat. No. 14343, U.S.N.M.

Eight females and five males reared from the eggs of *Oerina butyrospermi* Vuillet by Mr. Jean Vuillet, in whose honor the species is named; sent by Mr. A. Vuillet of the Entomological Station of the University of Rennes, France.

The species is peculiar in having the mesonotum entirely without thimble-like punctures.

ANASTATUS COLEMANI, new species.

Female.—Length about 3.5 mm. Head green, the face metallic reddish; punctured portion of median lobe and lateral lobes of mesoscutum bronzy, rest of median lobe bluish-green; scutellum bronzy; rest of thorax and legs varying shades of bronzy or purplish; knees, tarsi, and anterior and middle legs in front reddish testaceous, the middle legs less so than the anterior; abdomen aeneous with a white band near apex of first segment; face below antennæ roughened and laterad, granular; above, reticulated with impressed lines; scape

testaceous, pedicel greenish, basal joints of funicle aeneous, rest of antennæ brown; pedicel hardly twice as long as broad; first joint of funicle almost twice as long as pedicel; 2-5 joints successively decreasing in length, joints 6 and 7 subquadrate; club about as long as first joint of funicle; median and lateral lobes of mesoscutum finely reticulated with impressed lines, the former at rear with shallow crowded punctures; scutellum and axillæ with thimble-like punctures; mesopleuræ finely striate with impressed lines; wings dusky with hyaline bases and a curved hyaline band about middle of marginal vein, this band about as wide as the length of the stigmal vein, the concave side outward; marginal vein almost as long as the submarginal, postmarginal about half as long as marginal, stigmal less than half as long as postmarginal; abdomen short, the dorsum lineolate.

Male.—Unknown.

Habitat.—Bangalore, Mysore, India.

Two specimens reared from the eggs of *Degonetus serratus* and sent by Mr. L. C. Coleman (for whom the species is named) under his number 118.

In size and general appearance this species resembles *A. stantoni* Ashmead from the Philippine Islands, but that species is much greener and has the median lobe of the mesoscutum with thimble-like punctures.

Type.—Cat. No. 14344, U.S.N.M.

Family EULOPHIDÆ.

Subfamily ENTEDONINÆ.

PLEUROTROPIS FOVEOLATUS, new species.

Female.—Length about 1.25 mm. Deep purplish æneous with the propodeum and the base of the abdomen green; antennæ brown, more or less metallic; face above insertion of antennæ, both above and below V-shaped furrow, and median lobe of mesoscutum reticulately rugose; lateral lobes of mesoscutum with similar but less distinct sculpture and caudad, smooth; median lobe at apex longitudinally rugose and with two large foveæ; scutellum with the basal half longitudinally rugose, the apical half with large reticulations; propodeum polished, with two well separated medial carinæ and the lateral carinæ distinct; legs metallic, in part brown, the tarsi whitish.

Male.—Length about 1 mm. Similar to the female, the head green, face purple; sculpture of the face not so strong as in female.

Habitat.—Bangalore, Mysore, India.

Two females and two males reared from larvæ of *Epilachna vigintioctopunctata* and sent by Mr. Coleman under his number 134.

This species has the mesoscutum bifoveolate as in *P. bifoveolatus* Ashmead, but that species has the mesoscutum transversely rugulose.

Type.—Cat. No. 14345, U.S.N.M.

Subfamily TETRASTICHINÆ.

Genus TETRASTICHUS Haliday.

Key for the separation of the females of some Oriental forms.

1. First joint of funicle hardly longer than the pedicel; coxæ testaceous,
colemani Crawford.
- First joint of funicle about twice as long as pedicel; coxæ dark..... 2
2. Propodeum between lateral carinæ with thimblelike punctures. *echthrus* Crawford.
- Propodeum between lateral carinæ without thimblelike punctures..... 3
3. Legs whitish testaceous..... *philippinensis* Ashmead.
- Legs with femora brown..... *ophiusæ* Crawford.

TETRASTICHUS COLEMANI, new species.

Female.—Length about 1.8 mm. Green, the abdomen apically brown; scape and legs, including coxæ, testaceous; rest of antennæ light brown; first joint of funicle only slightly longer than pedicel, joints two and three about as long as first; club almost as long as 1–3 united; face finely, indistinctly lineolate, smoother medially and below; between eyes and mouth parts the lineolation reticulated; along inner orbits a few scattered large punctures; mesoscutum and scutellum finely longitudinally lineolate, the furrows distinct; metanotum a transverse strip; propodeum with the median and lateral carinæ strong; between them with crowded very shallow punctures; prepectus and metapleuræ with thimblelike punctures; mesopleuræ just beneath wing with a large testaceous spot; abdomen as long as head and thorax combined.

Male.—Length about 1.5 mm. Similar in color and sculpture to the female; the first joint of the funicle about as long as the pedicel, the second joint distinctly longer than the first; third and fourth joints about as long as first; club slightly longer than joints three and four combined; abdomen apically æneous.

Habitat.—Bangalore, Mysore, India.

Type.—Cat. No. 14346, U.S.N.M.

Many specimens reared from the larvæ of *Aspidomorpha miliaris* together with specimens of a *Tetracampe*?, and sent by Mr. Coleman (for whom this species is named) under his number 181.

TETRASTICHUS OPHIUSÆ, new species.

Female.—Length about 2.25 mm. Dark blue-green, coxæ metallic, trochanters and femora, except tips, brown, rest of legs testaceous; scape and pedicel brownish-testaceous, rest of antennæ deep brown; joints of funicle elongate, the first about twice as long as the pedicel; club slightly longer than first joint of funicle; face finely lineolate, along inner orbits with scattered large punctures; mesoscutum and scutellum finely longitudinally lineolate, the median furrow on the former and the two furrows on the latter very distinct; metanotum

reduced to a narrow smooth strip, propodeum with a distinct median, and lateral carinæ, the surface between them finely roughened; abdomen as long as the head and thorax combined.

Male.—Unknown.

Habitat.—Mysore, India.

Two specimens reared from *Ophiusa melicerta* and sent by Mr. Coleman under his number 37.

Type.—Cat. No. 14350, U.S.N.M.

Subfamily ELACHERTINÆ.

EUPLECTRUS NYCTEMERÆ, new species.

Female.—Length 1.75 mm. Black, the scape, pedicel, and legs, including coxæ, testaceous; rest of antennæ light brown; pedicel about as long as joint one of funicle, the latter not distinctly longer than the second joint; third and fourth joints about as long as second; middle lobe of mesoscutum reticulately rugose, at rear medially with one or two longitudinal rugose which extend forward about one-third the length of the mesoscutum; lateral lobes finely rugulose; scutellum basally indistinctly reticulate; first joint of hind tarsi almost twice as long as second, longer spur on hind tibiae not reaching apex of second tarsal joint; abdomen with a large testaceous spot, near base.

Male.—Unknown.

Habitat.—Bangalore, Mysore, India.

Four specimens reared from the larva of *Nyctemera lactinia* and sent by Mr. Coleman under his number 189.

Type.—Cat. No. 14347, U.S.N.M.

Easily separated from *E. manilæ* and *E. koebelei* by the row of pits at the base of the metathorax being covered by the scutellum; *E. manilæ* has the pedicel distinctly shorter than the first joint of the funicle; *E. koebelei* is larger, more robust, and has the legs distinctly reddish.

Subfamily EULOPHINÆ.

SYMPIESIS COMPEREI, new species.

Female.—Length about 2 mm. Dark blue-green, the head more bluish, the abdomen basally more greenish, the apical two-thirds of abdomen aenous; legs, except coxæ, scape and pedicel of antennæ, testaceous; rest of antennæ dark brown; face below antennæ finely reticulated with impressed lines, above antennæ these gradually disappearing; pedicel short, hardly half the length of the first joint of funicle, joints 2-4 of funicle subequal in length, slightly shorter than the first, and each about as long as the club; mesonotum, including axillæ and scutellum, with shallow thimblelike punctures those on the median lobe of mesoscutum coarse, those on axillæ finest; metanotum and propodeum smooth, the latter with a median carinæ

and with curved lateral carinæ the anterior ends turning inward; prepectus with thimblelike punctures; mesepisternum with similar finer punctures; rest of mesopleuræ and the metapleuræ smooth; abdomen as long as the head and thorax together; sheaths of ovipositor exerted.

Male.—Length about 1.5 mm. Similar to the female, but more greenish; the funicle of antennæ light brownish, branches long, reaching beyond apex of last joint of funicle; femora except tips dark brown; abdomen with the basal half whitish and testaceous.

Habitat.—Manila, Philippine Islands.

Three females and six males reared from a leaf miner on *Ficus*, species, by Mr. George Compere, for whom the species is named.

Type.—Cat. No. 14348, U.S.N.M.

A REVISION OF THE FORMS OF THE EDIBLE-NEST SWIFTLET, *COLLOCALIA FUCIPHAGA* (THUNBERG).

By HARRY C. OBERHOLSER,

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During the five years that have elapsed since the writer's revision of the genus *Collocalia* appeared,¹ the United States National Museum has acquired considerable additional material in this group. These specimens show that there are several more forms of *Collocalia fuciphaga* worthy of recognition, and that, in consequence, the ranges and characters of other races are more or less in need of readjustment. The following synopsis of the subspecies of *Collocalia fuciphaga* will, therefore, take the place of the one previously published.² In that review three forms of this species were recognized, not including *Collocalia brevirostris* McClelland, which was treated as a full species. The number is now raised to 10, among which are included *Collocalia brevirostris* and the recently discovered *Collocalia fuciphaga capnitis* Thayer and Bangs.³

The range of *Collocalia fuciphaga*, as a species, is extensive. It occurs west to the Himalaya Mountains at about 76° east longitude; north to central China, the Philippine Islands, Mariana Islands, and the Caroline Islands; east to the Duke of York Island (Union Group) and the Tonga Islands; south to the Loyalty Islands, New Guinea, Java, Nias, and the Seychelles Islands. It seems to be a permanent resident throughout its range.

Although the differences between the several races are apparently slight, they are reasonably constant, for individual variation is not great. As is the case with the other species of the genus, there is practically no sexual difference in either size or color, for which reason no distinction is necessary in color comparisons or measurement averages. All measurements are in millimeters.

The writer is indebted to Dr. Charles W. Richmond for many courtesies incident to the preparation of the present paper; also to Mr. William Palmer for the use of his Javan material; and to Mr. Outram Bangs for the loan of specimens additional to the United States National Museum series.

¹ Proc. Acad. Nat. Sci. Phila., July 26, 1906, pp. 177-212.

² Ibid. pp. 185-189.

³ Bull. Mus. Comp. Zool., vol. 52, 1909, p. 139.

KEY TO THE SUBSPECIES OF COLLOCALIA FUCIPHAGA.

- a. Wing over 210 mm.
 - b. Rump much paler than back.
 - c. Wing not less than 124 mm. *Collocalia fuciphaga brevirostris*.
 - c¹. Wing less than 124 mm. *Collocalia fuciphaga elaphra*.
 - b¹. Rump but little paler than back. *Collocalia fuciphaga capnitis*.
- a¹. Wing under 120 mm.
 - b. Rump decidedly paler than back.
 - c. Smaller; lower parts more brownish; upper parts paler, more brownish. *Collocalia fuciphaga fuciphaga*.
 - c¹. Larger; lower parts more grayish; upper parts darker, more blackish. *Collocalia fuciphaga amechana*.
 - b¹. Rump not paler than back.
 - c. Upper surface smoky clove brown. *Collocalia fuciphaga tachyptera*.
 - c¹. Upper surface brownish black or blackish brown.
 - d. Lower parts decidedly paler.
 - e. Under surface much more brownish; abdomen darker; upper surface slightly more brownish. *Collocalia fuciphaga vestita*.
 - e¹. Under surface much more grayish; abdomen lighter; upper surface slightly more blackish or greenish (less brownish).. *Collocalia fuciphaga mearnsi*.
 - d¹. Lower parts decidedly darker.
 - e. Under surface more brownish; upper surface somewhat lighter and more brownish. *Collocalia fuciphaga vanikorensis*.
 - e¹. Under surface more grayish; upper surface somewhat darker and less brownish. *Collocalia fuciphaga aerophila*.

COLLOCALIA FUCIPHAGA FUCIPHAGA (Thunberg).

Hirundo fuciphaga THUNBERG, K. Vet. Akad. Nya Handl., vol. 33, 1812, p. 153, pl. 4 (Java).

Hemiprocne salangana STREUBEL, Isis, 1848, p. 368 (East Indies).

Chars. subsp..—Upper parts rather light smoky clove brown with a faint greenish sheen, the rump distinctly paler; lower parts rather deep smoky brownish gray; size small (wing about 109 mm.).

Measurements.—Wing, 106–113 (average, 109.3) mm.; tail, 48.5–51 (49.9); exposed culmen, 4.5–4.9 (4.7); tarsus, 7–9.5 (8.2).

Type-locality.—Java.

Geographical distribution.—Java.

More satisfactory material from Java than was previously available proves that the bird inhabiting this island is one of the more brownish races, and not identical with that from the Philippine Islands or the islands of Polynesia. This race probably occurs on some of the neighboring islands, although we have seen no other than Javan specimens.

Measurements of specimens of Collocalia fuciphaga fuciphaga.

Museum and number.	Sex.	Locality.	Date.	Collector.	Wing.	Tail.	Exposed culmen.	Tarsus.
U.S.N.M. 219808...	Male....	Sawarna, Wykoop's Bay, Bantam, Java.	Nov. 15, 1909	W. Palmer..	102.5	50.0	4.7	8.0
U.S.N.M. 219811...	Female....	do.....	Nov. 7, 1909	.....do.....	108.0	50.0	4.6	7.9
U.S.N.M. 219809...	do.....	do.....	Nov. 5, 1909	.....do.....	106.0	50.0	4.9	8.5
U.S.N.M. 219810...	do.....	do.....	Nov. 6, 1909	.....do.....	110.0	48.5	4.6	7.0
A.N.S. Phila.....	.....	Java.....	Nov. ....	.....do.....	112.0	51.0	4.5	8.5

COLLOCALIA FUCIPHAGA AMECHANA, new subspecies.

Chars. subsp.—Similar to *Collocalia fuciphaga fuciphaga*, but somewhat larger; lower parts more grayish; upper surface darker, more blackish.

Description.—Type, adult female, No. 171072, U.S.N.M.; Pulo Jimaja, Anamba Islands, September 19, 1899; Dr. W. L. Abbott. Upper parts clove brown, with a slight metallic greenish sheen, the rump decidedly paler — dark hair brown; wings and tail blackish, with a decided metallic greenish sheen, the inner edges of the feathers lighter, more brownish; lores clove brown, the bases of the feathers pure white; cheeks, auriculars, and sides of neck deep smoky brown; lower surface grayish hair brown, darkest on chin and longest under tail-coverts, lightest on anal region; lining of wing clove brown; "iris dark brown; feet dark brown."

Measurements.—Wing, 110.5¹–113.5¹ (average, 112) mm.; tail, 51¹–51.5¹ (51.3); exposed culmen, 4.1–5 (4.6); tarsus, 9–9.3 (9.2).

Type-locality.—Pulo Jimaja, Anamba Islands.

Geographical distribution.—Pulo Jimaja and probably also other of the Anamba Islands.

The birds which form the basis of this new subspecies the writer recorded as *Collocalia fuciphaga elaphra* in his recent revision of the genus *Collocalia*,² but further material and further investigations show that they doubtless represent a local race, probably confined to the Anamba Islands. Curiously enough this new bird is nearest in color to *Collocalia fuciphaga elaphra*³ from the Seychelles Islands, but differs from that form in less brownish, rather darker, more glossy, more uniform upper parts; darker posterior lower surface; and in probably smaller size, although the molting condition of the primaries and rectrices makes this somewhat uncertain. But, at any rate, the form may be characterized by color alone.

Measurements of specimens of Collocalia fuciphaga amechana.

U. S. N. M. No.	Sex.	Locality.	Date.	Collector.	Total length. ⁴	Wing.	Tail.	Exposed culmen.	Tarsus.
171071	Female	Pulo Jimaja, Anamba Islands.	Sept. 19, 1899	Dr. W. L. Abbott.	mm. 127.0	mm. 113.5 ⁵	mm. 51.5 ⁵	mm. 5.0	mm. 9.3
171072 ⁶	do	do	do	do	124.0	110.5 ⁴	51.0 ⁴	4.1	9.0

¹ Molting; full measurements are probably somewhat greater than here given.

² Proc. Acad. Nat. Sci. Phila., July 26, 1906, p. 189.

³ Ibid., p. 188.

⁴ Measured in the flesh by the collector.

⁵ Molting.

⁶ Type.

COLLOCALIA FUCIPHAGA ELAPHRA Oberholser.

Collocalia fuciphaga elaphra OBERHOLSER, Proc. Acad. Nat. Sci. Phila., July 26, 1906, p. 188 (Mahé Island, Seychelles Islands).

Chars. subsp.—Resembling *Collocalia fuciphaga amechana*, but with upper surface more brownish, rather lighter, less glossy, and less uniform, the pileum more contrasted with the back; posterior lower parts paler, and with less evident dark shaft streaks; apparently also somewhat smaller.

Measurements.—Wing, 120.5–121 (average, 120.8) mm.; tail, 51; exposed culmen, 4–4.5 (4.3); tarsus, 9–9.5 (9.3).

Type-locality.—Mahé Island, Seychelles Islands.

Geographical distribution.—Mahé Island, and probably other islands of the Seychelles group.

This well-marked race is easily distinguished from the Javan *Collocalia fuciphaga fuciphaga* by its much greater size, lighter under parts, and rather darker upper surface. By the above separation of the Anamba Islands form it becomes confined, so far as known, to the Seychelles Islands.

Measurements of specimens of Collocalia fuciphaga elaphra.

Museum and number.	Sex.	Locality.	Date.	Collector.	Wing.	Tail.	Exposed culmen.	Tarsus.
U. S. N. M. 119780..	Female.	Mahé, Seychelles Islands.	Apr. 17, 1890	Dr. W. L. Abbott.	mm. 120.5	mm. 51.0	mm. 4.5	mm. 9.0
U. S. N. M. 119779 ¹	.....	.....do.....	.....do.....	.....do.....	121.0	51.0	4.0	9.5

COLLOCALIA FUCIPHAGA BREVIROSTRIS (McClelland).

Hirundo brevirostris MCCLELLAND, Proc. Zool. Soc. Lond., 1839, p. 155 (Assam).

Chars. subsp.—Similar to *Collocalia fuciphaga fuciphaga*, including the lighter-colored rump; but much larger, and with tail somewhat less deeply emarginate.

Measurements.—Wing, 124–127 mm.; tail, 55–59; exposed culmen, 5.5; tarsus, 10.

Type-locality.—Assam.

Geographical distribution.—Himalaya Mountains, from Dalhousie, about 76° east longitude, east through Nepal and Sikhim to Assam and Manipur.

This bird the writer previously considered as a full species,² but the discovery of *Collocalia fuciphaga capnitis*,³ which is intermediate in size between *C. f. brevirostris* and *C. f. fuciphaga*, indicates that the former is, as Dr. Hartert considers it,⁴ only a subspecies.

¹ Type.

² Proc. Acad. Nat. Sci. Phila., July 26, 1906, p. 189.

³ Thayer and Bangs, Bull. Mus. Comp. Zool., vol. 52, 1906, p. 129.

⁴ Tierreich, Lief. 1, 1897, p. 68.

COLLOCALIA FUCIPHAGA CAPNITIS Thayer and Bangs.

Collocalia fuciphaga [sic] *capnitis* THAYER and BANGS, Bull. Mus. Comp. Zool., vol. 52, May, 1909, p. 139 (Wan-tao-shan, Hupeh, China).

Chars. subsp.—Resembling *Collocalia fuciphaga fuciphaga*, but much larger; lower parts much more grayish, with dark shaft streaks more conspicuous; upper surface less brownish and more uniform—the rump, while appreciably paler than the back, being much less thus contrasted.

Description.—Type, adult male, No. 50013, Museum of Comparative Zoology; Wan-tao-shan, Hupeh, central China, June 5, 1907; Walter R. Zappey. Upper parts clove brown, slightly greenish, the rump somewhat paler than the back, but not conspicuously so; tail clove brown, all but the outer pair very slightly glossed with greenish; exposed surface of the wing-coverts like the back; wing-quills clove brown, very slightly glossed on exterior webs with greenish, the inner webs much paler, more so basally; ear-coverts and sides of neck smoky brown; lores pure white basally, the feather tips clove brown; under surface somewhat brownish smoke gray, a little the darkest on the breast, posteriorly with very evident dark brown shaft lines, these heaviest and darkest on the lower tail-coverts.

Measurements.—Wing, 122 mm.; tail, 58; exposed culmen, 5; tarsus, 10.1.

Type-locality.—Wan-tao-shan, Province of Hupeh, China.

Geographical distribution.—Province of Hupeh, central China.

This northern race is apparently about the size of *Collocalia fuciphaga elaphra*, perhaps a little larger; but it is very much less brownish above, with a decidedly more greenish sheen, and the rump is but little paler than the back; the smoky gray of the lower surface is less brownish, and is darker posteriorly; the dark shaft streaks on the breast and abdomen are more conspicuous. Compared with *Collocalia fuciphaga amechana*, of the Anamba Islands, it is larger, more brownish, somewhat more greenish-glossed on the upper parts, with the rump much less paler than the back; lower surface not so brownish, and posteriorly darker; dusky shaft streaks on breast and abdomen more evident.

The type is the only specimen thus far known.

COLLOCALIA FUCIPHAGA VESTITA (Lesson).

Salangana vestita LESSON, l'Echo du Monde Savant, ser. 2, vol. 8, 1843, p. 134 (Sumatra).

Collocalia nidifica GRAY, Genera Birds, vol. 1, 1845, p. 55 (Sumatra).

Chars. subsp.—Similar to *Collocalia fuciphaga fuciphaga*, but apparently somewhat larger; lower surface somewhat lighter; upper parts decidedly darker, more blackish (less brownish), and almost uniform, the rump not appreciably lighter than the back, the pileum scarcely, if any, darker.

Measurements.—Wing, 111–118 (average, 114.1) mm.; tail, 48–52 (50.5); exposed culmen, 4–5 (4.6); tarsus, 9–9.5 (9.1).

Type-locality.—Sumatra.

Geographical distribution.—Sumatra, Simalur Island, and the southern part of the Malay Peninsula.

This subspecies may be distinguished from *Collocalia fuciphaga amechana* by its darker, more blackish (less brownish) upper parts, and its dark rump, uniform in color with the back. From *Collocalia fuciphaga elaphra*, its smaller size, darker, less brownish, more uniform upper surface (the rump concolor with the back), and its darker posterior ventral surface separate it easily. It is decidedly smaller than *Collocalia fuciphaga capnitis*, and darker, more blackish above, with less of greenish gloss; the rump is not at all paler than the back; the lower parts are rather more brownish, with much less conspicuous shaft-streaks posteriorly.

The names for the present race and their application were discussed in my previous paper.¹

No specimens from either Borneo or the Natuna Islands have been available, and the form of this species occurring in these localities is therefore in doubt.

Measurements of specimens of Collocalia fuciphaga vestita.

Museum and number.	Sex.	Locality.	Date.	Collector.	Wing.	Tail.	Exposed culmen.	Tarsus.
U.S.N.M., 179170.	Male....	Simalur Island, western Sumatra.	Dec. 7, 1901	Dr. W. L. Abbott.	mm. 111.0	mm. 51.0	mm. 5.0	mm. 9.0
U.S.N.M., 179171.	Female....	do.....	do.....	do.....	112.5	49.0	4.5	9.0
U.S.N.M., 178933.	Male....	Tanjong Siantel, eastern coast of Johore, Malay Peninsula.	July 26, 1901	do.....	118.0	51.0	5.0	9.0
A.N.S. Phila. ....	.....	Sumatra.....	.....	.....	115.0	52.0	4.0	9.0

COLLOCALIA FUCIPHAGA AEROPHILA, new subspecies.

Chars. subsp.—Similar to *Collocalia fuciphaga vestita*, but lower parts much darker; somewhat more grayish (less brownish); upper surface darker, more blackish (less brownish).

Description.—Type, adult male, No. 179737, U.S.N.M.; Siaba Bay, Nias Island, western coast of Sumatra, March 16, 1903; Dr. W. L. Abbott. Upper parts blackish clove brown, with a slight greenish gloss; wings and tail brownish black with greenish or violet reflections, the inner edges of the feathers dull brown; lores clove brown, the bases of the feathers pure white; cheeks, auriculars, and sides of neck deep smoky brown; lower surface deep grayish hair brown; lining of wing clove brown.

Measurements (of type).—Wing, 114.5 mm.; tail, 54; exposed culmen, 4.5; tarsus, 8.

¹ Proc. Acad. Nat. Sci. Phila., July 26, 1906, p. 187.

Type-locality.—Siaba Bay, Nias Island, western coast of Sumatra.

Geographical distribution.—Island of Nias.

This race differs from *Collocalia fuciphaga fuciphaga* in its somewhat greater size; much more blackish (less brownish), more uniform upper surface, the rump not at all paler than the back; and darker, less brownish lower parts. It is much darker, less brownish (more blackish) above than *Collocalia fuciphaga amechana*, the rump concolor with the back, instead of decidedly paler; and the entire inferior surface is very much more deeply colored. It departs still more from *Collocalia fuciphaga elaphra* in its smaller size, uniform and much darker, less brownish, more greenish glossed upper surface, and much darker, less brownish under parts. Compared with *Collocalia fuciphaga capnitis*, it is much smaller; is decidedly darker, more blackish, more uniform above, and darker, with less evident dusky shaft streaks below.

The single specimen on which the separation of this race is based was referred by the writer, in his previous paper,¹ to *Collocalia fuciphaga fuciphaga*, under a mistaken conception of the characters of true *Collocalia fuciphaga fuciphaga* from Java, owing to imperfect and scanty material; but the acquisition of more Javan specimens proves that the Nias bird is very distinct.

COLLOCALIA FUCIPHAGA MEARNSI,² new subspecies.

Chars. subsp.—Resembling *Collocalia fuciphaga vestita*, but under surface much more grayish (less brownish); abdomen usually lighter; upper parts, particularly the pileum, more blackish or greenish (less brownish).

Description.—Type, adult female, No. 208356, U.S.N.M.; Hights-in-the-Oaks, altitude 7,000 feet, near Paoay, Benguet, Luzon Island, Philippine Islands, July 28, 1907; Dr. Edgar A. Mearns. Upper parts blackish clove brown, with a slight greenish sheen; wings and tail brownish black with greenish or violet reflections, the inner edges of the feathers dull brown; lores clove brown, the bases of the feathers pure white; cheeks, auriculars, and sides of neck deep smoky brown; under surface smoke gray; lining of wing clove brown.

Measurements.—Wing, 106–119.5 (average, 111.5) mm.; tail, 45–52 (49.3); exposed culmen, 3.5–5 (4); tarsus, 8.1–10 (9).

Type-locality.—Hights-in-the-Oaks, near Paoay, Province of Benguet, Luzon Island, Philippine Islands.

Geographical distribution.—Islands of Luzon, Mindoro, Mindanao, Cebu, Negros, Panay, and Palawan, in the Philippine Archipelago.

This new race may be readily distinguished from *Collocalia fuciphaga fuciphaga* by its darker, less brownish, more greenish-glossed,

¹ Proc. Acad. Nat. Sci. Phila., July 26, 1906, pp. 186–187.

² Dedicated to Dr. (Lieut. Col.) Edgar A. Mearns, the well-known explorer, who collected the entire series of specimens in the U. S. National Museum.

and more uniform upper surface, the rump concolor with the back, instead of paler; lighter, and much less brownish (more grayish) lower parts. From *Collocalia fuciphaga amechana* it differs in its darker, more blackish (less brownish), more uniform upper surface, and lighter, less brownish ventral surface. It is still more different from *Collocalia fuciphaga elaphra*, by reason of its much smaller size; much darker, less brownish, and more uniform upper surface; less brownish under surface; and darker abdomen and crissum. Compared with *Collocalia fuciphaga capnitis* it is much smaller, with upper surface darker, more blackish (less brownish), and rump concolor with back, lower parts less brownish, anteriorly rather lighter, and posteriorly with less well-marked dusky shaft lines. Although on the upper surface it is practically identical with *Collocalia fuciphaga aerophila* of Nias Island, it is easily separable by its decidedly paler and much less brownish lower parts.

A satisfactory series of 15 specimens, collected by Dr. Edgar A. Mearns on the islands of Mindanao, Mindoro, and Luzon, shows that the birds of the Philippine Islands are not identical with either the Javan race (*Collocalia fuciphaga fuciphaga*) or the birds of the islands in the Pacific Ocean farther eastward, as the writer formerly supposed,¹ but have well-marked characters of their own, as above set forth. Some of the individuals of this series are more brownish both above and below than the average, but as a whole they are very uniform in color. It is noticeable that there is considerable variation in measurements.

Measurements of specimens of Collocalia fuciphaga mearnsi.

U. S. N. M. number.	Sex.	Locality.	Date.	Collector.	Wing.	Tail.	Exposed culmen.	Tarsus.
191447	Male....	Mercedes, Mindanao Island, Philippine Islands.	Dec. 19, 1903	Dr. E. A. Mearns	114.0	50.0	5.0	10.0
208354	...do....	Haights - in - the - Oaks (near Pacey), Benguet, Luzon Is- land, Philippine Islands.	July 25, 1907	.....do.....	119.5	52.0	3.7	8.1
208353	...do....	.....do.....	.....do.....	.....do.....	109.0	50.5	4.0	9.0
208348	...do....	Baguio, Benguet, Luzon Island, Philippine Islands.	Apr. 30, 1907	.....do.....	112.0	52.0	4.0	9.0
208351	...do....	.....do.....	July 12, 1907	.....do.....	112.5	51.5	4.5	9.5
201920	.....	Buena Vista (Mangyan clear- ing), Mindoro Island, Philip- pine Islands.	Nov. 5, 1906	.....do.....	106.0	46.5	3.6	9.3
201922	.....	Manay, Mindanao Island, Phil- ippine Islands.	Oct. 6, 1906	.....do.....	108.5	45.0	4.0	8.9
190172	Female..	Pantar, Mindanao Island, Phil- ippine Islands.	Aug. 13, 1903	.....do.....	108.0	48.0	4.5	8.5
201921	...do....	Mangyan clearing, Alogag River, Mindoro Island, Philippine Islands.	Nov. 10, 1906	.....do.....	107.0	46.0	3.5	9.1
208350	...do....	Baguio, Benguet, Luzon Is- land, Philippine Islands.	May 9, 1907	.....do.....	115.0	50.0	.....	9.0
208355	...do....	Haights-in-the-Oaks, Benguet, Luzon Island, Philippine Islands.	July 25, 1907	.....do.....	.....	47.0	3.8	9.0
208352	...do....	.....do.....	.....do.....	.....do.....	112.0	51.0	4.0	9.0
208570	...do....	.....do.....	July 26, 1907	.....do.....	113.0	50.0	4.1	8.7
208356	...do....	.....do.....	July 28, 1907	.....do.....	113.0	50.0	3.5	9.1

¹ Proc. Acad. Nat. Sci. Phila., July 26, 1906, pp. 186-187.

* Type.

COLLOCALIA FUCIPHAGA VANIKORENSIS (Quoy and Gaimard).

Hirundo vanikorensis QUOY and GAIMARD, Voy. *Astrolabe*, Zool., vol. 1, 1830, p. 206, pl. 12, fig. 3 (Vanikoro Island, Santa Cruz Islands, Pacific Ocean).

Cotyle vanicorensis BOIE, Isis, 1844, p. 170 (nom. emend. pro *Hirundo vanikorensis* Quoy and Gaimard).

Cypselus inquietus KITTLITZ, Denkwurd. Reise Russ. Amer., vol. 2, 1858, p. 26 (Uala Island, Caroline Islands, Pacific Ocean).

Chars. subsp.—Similar to *Collocalia fuciphaga mearnsi*, but upper surface more brownish; lower parts decidedly darker and more brownish.

Measurements.—Wing, 109–114 (average, 111.5) mm.; tail, 54; exposed culmen, 4; tarsus, 9.

Type-locality.—Vanikoro Island, Santa Cruz Islands, Pacific Ocean.

Geographical distribution.—Islands of the western Pacific Ocean: north to the Caroline Islands; west to New Guinea; south to the Loyalty Islands; and east to the Tonga Islands and the Duke of York Island (Union group).

From *Collocalia fuciphaga fuciphaga* the present race may be separated by its much darker, more blackish (less brownish), more uniform upper surface; dark rump concolor with the back; and decidedly darker under parts. It is distinguishable from *Collocalia fuciphaga amechana* by its darker, more blackish upper parts, dark rump uniform with the back, and far more deeply colored and more brownish ventral surface. Compared with *Collocalia fuciphaga elaphra* it is much smaller, with darker, less brownish upper surface, rump not lighter than the back, and very much more deeply colored lower parts. It is very much smaller than *Collocalia fuciphaga capnitis*, and has the upper surface darker, less glossed with greenish, the rump concolor with the back, the lower parts much darker, more brownish, with scarcely appreciable darker shaft lines on the posterior portion. It may be distinguished from *Collocalia fuciphaga vestita* by its very much more deeply colored, more brownish lower surface, and slightly darker, less greenish upper parts. It is apparently closest in color to *Collocalia fuciphaga aerophila*, but differs in rather more brownish, less greenish-glossed upper surface, and in darker, decidedly more brownish lower parts.

Birds from the Caroline Islands are, by the characters above given, with ease subspecifically separable from true *Collocalia fuciphaga fuciphaga* of Java; although the writer on a previous occasion¹ was not able to distinguish the present race with the material then available.

Without specimens from the Santa Cruz and neighboring islands, I am now obliged to consider the birds from there the same as those from the Carolines, although they may represent an additional race. The name to be applied to the present form is, therefore, of necessity, *Hirundo vanikorensis* Quoy and Gaimard,² from Vanikoro Island, the

¹ Proc. Acad. Nat. Sci. Phila., July 26, 1906, p. 186.

² Voy. *Astrolabe*, Zool., vol. 1, 1830, p. 206, pl. 12, fig. 3.

plate and description of which, moreover, apply very well to the Caroline Islands bird, subsequently called *Cypselus inquietus* by Kittlitz.¹

Measurements of specimens of Collocalia fuciphaga vanikorensis.

U. S. N. M. number.	Sex.	Locality.	Date.	Collector.	Wing.	Tail.	Exposed culmen.	Tarsus.
212337	Male...	Kusaie Island, ² Caroline Islands.	Feb. 8, 1900	C. H. Townsend.	mm. 114.0	mm. 54.0	mm. 4.0	mm. 9.0
212336	.....	Uala Island, Caroline Islands....	Feb. 16, 1900	.....do.....	109.0	54.0	4.0	9.0

COLLOCALIA FUCIPHAGA TACHYPTERA, new subspecies.

Chars. subsp.—Similar to *Collocalia fuciphaga vanikorensis*, but much lighter, more brownish above, and paler below.

Description.—Type, adult male, No. 188855, U.S.N.M.; Guam Island, Mariana Islands, July 17, 1900; A. Seale. Upper parts rather light smoky clove brown, with a slight greenish sheen, and somewhat darker on pileum; wings and tail clove brown with a slight greenish gloss; lores clove brown, the bases of the feathers pure white; sides of head and neck deep smoky brown; lower surface hair brown; lining of wing clove brown.

Measurements.—Wing, 110 mm.; tail, 50; exposed culmen, 3.5; tarsus, 8.

Type-locality.—Guam Island, Mariana Islands.

Geographical distribution.—Island of Guam, and probably other islands of the Mariana group.

The present form is distinguishable from *Collocalia fuciphaga fuciphaga* chiefly by its dark-colored rump concolor with the back, and by rather lighter upper surface. From *Collocalia fuciphaga amechana* it differs as does *Collocalia f. fuciphaga*, and additionally in its lack of a pale rump. It is much smaller than *Collocalia fuciphaga elaphra*, lighter, more uniform above (the rump not paler than the back), and darker below. Compared with *Collocalia fuciphaga capnitis*, it is decidedly smaller, rather lighter and much more brownish above, with the rump not even a little paler than the back; is more brownish on the lower surface, with much less evident dusky shaft lines. It is somewhat smaller than *Collocalia fuciphaga vestita*, and decidedly lighter, more brownish above. It may be distinguished from *Collocalia fuciphaga aerophila* by somewhat smaller size, much lighter, more brownish upper parts, and somewhat paler, decidedly more brownish lower surface. From *Collocalia fuciphaga mearnsi* it may be separated by its much lighter, more brownish upper parts, and darker, more brownish under surface.

The single specimen upon which the above description is based was recorded as *Collocalia fuciphaga fuciphaga* in my previous paper on *Collocalia*,³ but judging from the material now available it must be considered as belonging to a distinct race.

¹ Denkwurd. Reise Russ. Amer., vol. 2, 1858, p. 26.

² Inadvertently recorded (Proc. Acad. Nat. Sci. Phila., July 26, 1906, p. 187) as from Uala Island.

³ Proc. Acad. Nat. Sci. Phila., July 26, 1906, p. 186.

A SMALL COLLECTION OF BATS FROM PANAMA.

By GERRIT S. MILLER, Jr.,

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INTRODUCTION.

Mr. August Busck, while collecting insects for the Smithsonian Biological Survey of Panama during April and May, 1911, obtained 29 bats representing 11 species. Three of these have not hitherto been described, and a fourth is exceedingly rare in collections. More than half of the specimens were taken near Alhajuela, on the Chilibrillo River, in some extensive caves, a locality so little known and so interesting that I have asked Mr. Busck to prepare for publication the following rather detailed account of his visit.

THE CHILIBRILLO BAT CAVE.

The large cave in which these bats were collected is formed in a broad limestone area, which crosses the Chagres River between Alhajuela and San Juan, Panama. The cave is made by a subterranean stream, which empties into the Chilibrillo River about 7 to 8 miles south of Alhajuela. Neither the cave nor the Chilibrillo River (which is a tributary to the Chilibri River) is shown on the late American map made by the Canal Commission, but was found indicated on an old French map. The region is uninhabited for many square miles and is rarely visited, even by the natives from the nearest settlements along the Chagres, none of whom knew about the cave. There are no roads or tracks leading to the cave, but it may be found by going due south from Alhajuela until reaching the Chilibrillo, which at this point runs nearly east to west, with the next turn at right angles to south. By following this river down its course for 2 or 3 miles the outlet of the subterranean stream is found in a little brook on the left, the first tributary met with on that side. At this spot the course of the Chilibrillo is southwest with the next turn to the left.

The river bed of the Chilibrillo is solid limestone, and walking during the dry season is reasonably easy, wading shoe top to breast deep in

crystal clear water, swarming with many-colored fishes. To a naturalist the natural highways of the small streams are extremely profitable in the dry season, when the higher land is as dry as dust. Birds, mammals, and insect life necessarily seek the limited areas of humidity along the creeks.

The brook leading to the cave was at the time of the visit—April 14, the very end of the dry season—a series of stagnant pools. For the first 300 or 400 feet the bed is 25 to 30 feet wide and fairly smooth limestone, with gullies and potholes a foot or two deep; then the gullies deepen and the rock is cut out in fantastic longitudinal curved and twisted shapes. Near the cave these gullies are very deep and narrow and were plainly at one time part of the cave, of which the roof now has fallen in. The gullies lead to the mouth of the cave, which is some 20 feet high and 8 feet in width, with water nearly waist deep. During the rainy season it would be impossible to enter this part of the cave. The passage soon forks and one branch runs some 200 feet straight east, with various narrow cross-passages at right angles, which are again crossed at right angles by numerous similar channels resembling the streets in a city. By keeping to the right one comes round a block, back to the starting point. There appeared to be some 20 such large blocks, but there may be many more. Sometimes the passages are several feet in width and 20 to 30 feet or more high, with breast-deep water; other passages were narrow, low, and dry. Bats nearly everywhere, the roof either hung with them or with stalactites or covered by a delicately formed layer of lime deposit, scintillating in the light of the lantern; in two or more places, narrow chimneys leading to the green world above.

The other main passage to the left from the mouth of the cave leads, after being cut by several cross alleys, through a place where the roof of the cave has fallen down some 60 feet to another quite different part of the cave, a dry long room nearly 40 feet wide and from 30 to 50 feet high. About 400 feet in from the mouth of this cave was a large, uninviting stagnant pool reeking with bat manure and too deep to cross without swimming. By the faint light of the lantern it could be seen that the cave continues on the other side of the pool to the left. The cave at this point was some 60 to 70 feet high. Thousands of bats of several species swarmed in and out, and a few samples were secured in the insect net, stunned, and placed in tight tin boxes in order to secure their numerous parasites at leisure at home.

Through a very narrow and low channel to the right, about the middle of this cave, where it was necessary to crawl on all fours for some 80 or 100 feet, a third and still larger cave was reached—an enormous amphitheater some 250 feet in diameter with a low hemispherical roof 20 feet over the floor in the middle, hung with large and small delicate stalactites never touched by human hands.

The floor, which consisted of soft bat manure, was studded with thousands of peculiar knob-like stalagmites. Only a few bats were seen in this cave, which, however, may well have had one or more unobserved side galleries. A long winding upwardly sloping corridor guarded by giant stalactites led to a small exit hole some 300 yards from the mouth of the first cave. The time did not permit further exploring, but it is probable that only a fraction of the cave area was inspected and that it will be found to stretch for miles along the course of the subterranean stream, toward the picturesque cliffs on the Chagres River between Alhajuela and Vijia.

ANNOTATED LIST OF SPECIES.

CHILONYCTERIS RUBIGINOSA Wagner.

Ten adult males from the Chilibrillo cave. The length of forearm ranges from 58 to 61.5 mm. Extremes of cranial measurements: Greatest length, 21.8–22.8 mm.; condylobasal length, 20.8–21.8; mandible, 16–17; maxillary tooth row (exclusive of incisors), 9.6–10; mandibular tooth row (exclusive of incisors), 10–10.6.

LONCHORHINA AURITA Temes.

Two specimens of this very rare bat were taken in the Chilibrillo cave. Their measurements, adult male and female, are respectively: Head and body, 60 and 62 mm.; tail, 57 and 58; tibia, 21 and 20.4; foot, 12.6 and 13; forearm, 49.6 and 50; thumb, 10.6 and 10; third finger, 101 and 101; fifth finger, 70 and 70; ear from meatus, 29 and 28; width of ear, 22 and 23; posterior surface of noseleaf, 22 and 21; condylobasal length of skull, 18.4 and 19.2; zygomatic breadth, 11 and 10.8; interorbital constriction, 5 and 5; mastoid breadth, 11 and 10.6; lachrymal breadth, 6.6 and 6.4; depth of brain case at middle, 6.8 and 6.8; mandible, 13.2 and 13; maxillary tooth row, 6.6 and 6.6; mandibular tooth row, 7.2 and 7.2.

PHYLLOSTOMUS HASTATUS (Pallas).

Adult male, Cabima. Head and body, 128 mm.; tail, 28; tibia, 34; foot, 23.6; forearm, 91; thumb, 16.4; third finger, 174; fifth finger, 116; ear from meatus, 31; width of ear, 21.4; condylobasal length of skull, 36.2; zygomatic breadth, 22.6; interorbital constriction, 7.8; mastoid breadth, 21.4; depth of brain case at middle, 12.2; mandible, 28.2; maxillary tooth row, 15; mandibular tooth row, 17.

LONCHOPHYLLA ROBUSTA, new species.

Type.—Adult male (in alcohol), No. 173854, U.S.N.M. Collected in cave on Chilibrillo River, Panama, April 14, 1911, by August Busck.

Diagnosis.—Size decidedly greater than in *Lonchophylla mordax* and *L. thomasi* (forearm about 43 mm., condylobasal length of skull

about 25 mm.); skull large and robust (not narrowed and *Chaeronycteris*-like, as in the equally large *L. hesperia* G. M. Allen*), its size and general appearance much like that of *Leptonycteris nivalis*; teeth peculiar in the unusual development of inner lobe of pm^4 and the subquadrate outline of crown in m^1 and m^2 .

External characters.—Essentially like *L. mordax*, apart from the larger size, but foot not so long relatively to tibia, and interfemoral membrane apparently wider.

Color.—Upper parts between mars-brown and raw-umber, the hairs becoming much paler (approaching ecru-drab) at base; underparts light isabella-color tinged with raw-umber, not contrasted noticeably with back.

Skull and teeth.—Apart from its large size and robust general form the skull does not differ essentially from that of *Lonchophylla mordax*. Rostrum less elongate in proportion to its depth; mesopterygoid space relatively shorter and wider; basisphenoid pits with anterior border less sharply defined.

Incisors and canines as in *L. mordax*, except that the cutting edge of lower incisors is less distinctly trilobate. Premolars like those of the smaller animal, but small basal cusps tending to be better developed, and inner root of pm^4 situated decidedly behind middle of tooth. Upper molars much less reduced than in *L. mordax*, the length of the inner portion of tooth so great as to give the crown a decidedly squarish outline, especially in m^1 and m^2 ; outer portion of tooth, representing the styles and commissures, unusually well developed, the margin of the ridge standing more nearly at level of points of main cusps than in the related species. Lower molars with relatively wider crowns and higher cusps than in *L. mordax*, but details of their structure showing no special peculiarities.

Measurements.—Type and adult female: Head and body, 56 and 60 mm.; tail, 6† and 10; width of interfemoral membrane at middle, 15 and 15; tibia, 17.6 and 17; foot, 10.4 and 10.4; forearm, 43.6 and 43; thumb, 11 and 12; third finger, 88 and 86; fifth finger, 59 and 56; ear from meatus, 16 and 14; condylobasal length of skull, 25.2 and 25.4; breadth of rostrum over roots of canines, 4.2 and 4.2; interorbital constriction, 5.2 and 5.4; breadth of brain case, 10.2 and 10; mastoid breadth, 11.2 and 11; depth of brain case at middle, 7.4 and 7.2; mandible, 18.4 and 18.8; maxillary tooth row, exclusive of incisors, 9.8 and 10; mandibular tooth row, exclusive of incisors, 10.2 and 10.

Specimens examined.—Four, all from the Chilibrillo cave.

* Through the kindness of Mr. Samuel Henshaw and Dr. Glover M. Allen I have been enabled to examine the type of this species. The animal is so different from the other known forms of *Lonchophylla* that it can hardly be regarded as a member of the same genus.

† Apparently injured at tip.

HEMIDERMA PERSPICILLATUM AZTECUM Hahn.

One specimen from the Chilibrillo cave.

VAMPTROPS HELLERI Peters.

Two immature males from Cabima. Forearm 39 and 39.6 mm.

VAMPYRESSA MINUTA, new species.

Type.—Immature female (permanent dentition in place, but basal suture not closed and finger joints not fully formed) in alcohol, No. 173832, U.S.N.M. Collected at Cabima, Panama, May, 1911, by August Busck.

Diagnosis.—Noticeably smaller than *Vampyressa pusilla*, as described and figured by Peters; skull with brain case relatively large and rostrum relatively short (this perhaps in part due to immaturity); teeth in general as figured by Peters, but with the following peculiarities: Posterior upper premolar with postero-external cusp less developed, its base not sufficiently projecting to produce a concavity on hinder border of tooth; first upper molar with longitudinal diameter through protocone about equal to length of outer border; the large protocone almost isolated from inner border; second lower molar with crown more narrowed posteriorly.

Color.—General color ecru-drab, clear below, overlaid with broccoli-brown above; white face markings barely indicated, the lower stripe disappearing in certain lights.

Measurements.—Head and body, 44 mm.; tibia, 11; foot, 7.5; forearm, 31.5; third finger, 70; fifth finger, 46; ear from meatus, 12; width of ear, 8; condylobasal length of skull, 16.2; greatest length, 18; zygomatic breadth, 10; interorbital constriction, 4.4; mastoid breadth, 9.2; breadth of brain case, 8; depth of brain case, at middle, 6.8; mandible, 11.2; maxillary tooth row, 5.6; mandibular tooth row, 6.

Specimen examined.—The type.

CHIRODERMA ISTHEMICUM, new species.

Type.—Adult female (in alcohol), No. 173834, U.S.N.M. Collected at Cabima, Panama, May, 1911, by August Busck.

Diagnosis.—Similar in size and essential characters to *Chiroderma villosum* Peters, but ear narrower above, back with an evident whitish median stripe, and skull shorter and proportionally broader.

External form.—As in *C. villosum* as figured by Peters, but ear narrowing gradually upward, its widest region about at level of base of anterior border.

Color.—Upper parts isabella-color, the individual hairs broccoli-brown (darker than that of Ridgway) through basal third, then abruptly light gray tinged with ochraceous-buff, the extreme tips

again brown like base; in region in front of shoulders the light intermediate area becomes more noticeable, particularly near base of ear and behind nose leaf; a whitish dorsal line less conspicuous than in *C. salvini* and becoming obsolete posteriorly. Underparts ecru-drab, with a slight and very fine variegation caused by minute whitish hair tips and brownish subterminal annulation.

Skull and teeth.—The skull differs from that of *Chiroderma villosum* as figured by Peters in its broader general form due to shortening without proportional narrowing. The profile of rostrum immediately behind nasal aperture is concave, while in the related species it is represented as decidedly convex. Teeth like those of *C. villosum*, but incisors apparently more reduced, the outer upper tooth not nearly filling space between inner incisor and canine, the lower teeth distinctly spaced, their cutting edges scarcely bilobed.

Measurements.—Type: Head and body, 65 mm.; tibia, 17; foot, 10.4; forearm, 45; thumb, 10.5; third finger, 99; fifth finger, 70; ear from meatus, 18; width of ear, 12.5; condylobasal length of skull, 22 (24.4);¹ greatest length, 24.6 (26.8);² zygomatic breadth, 15.6 (—); postorbital constriction, 5.8 (5.8); interorbital constriction, 6.2 (6.4); mastoid breadth, 12.2 (12.8); breadth of brain case, 10.4 (10.4); depth of brain case at middle, 8.4 (—); mandible, 8.8 (10); maxillary tooth row, 8.8 (10); mandibular tooth row, 9.2 (10.6).

Specimens examined.—Two, both from the type-locality.

ARTIBEUS JAMAICENSIS JAMAICENSIS (Gosse).

Three adults from Taboga Island and one young (too immature to be positively identified) from the Chilibrillo cave.

DESMODUS ROTUNDUS (Geoffroy).

Adult female from Taboga Island. Measurements: Head and body, 82 mm.; tibia, 27.2; foot, 16; forearm, 59.6; thumb, 16.6; third finger, 98; fifth finger, 77; ear from meatus, 17.4; width of ear, 16; condylobasal length of skull, 21.4; greatest length, 24; zygomatic breadth, 12; postorbital constriction, 5.8; breadth of brain case, 11.8; depth of brain case at middle, 10.6; mandible, 15.2; maxillary tooth row (entire), 6.4; mandibular tooth row (entire), 7.

EUMOPS GLAUCINUS (Wagner).

Adult male, Paraiso, April 28, 1911. Measurements: Head and body, 80 mm.; tail, 48; tibia, 16.4; foot, 11; forearm, 56; thumb, 10; third finger, 114; fifth finger, 55; ear from meatus, 20; width of ear, 22; condylobasal length of skull, 21; greatest length, 23.2; zygomatic breadth, 14; interorbital constriction, 4.4; lachrymal breadth, 8; breadth of brain case, 11; depth of brain case at middle, 7; mandible, 16.6; maxillary tooth row, 9.2; mandibular tooth row, 10.2.

¹ Measurements in parenthesis are those of an adult *C. salvini* from Angostura, Costa Rica (No. 22849).

² In *C. villosum* the greatest length is 25.7 mm.; zygomatic breadth, 16.5.

DESCRIPTION OF A NEW SPECIES OF ISOPOD OF THE GENUS CLEANTIS FROM JAPAN.

By HARRIET RICHARDSON,

Collaborator, Division of Marine Invertebrates, United States National Museum.

The following description is of a new species of Isopod crustacean belonging to the genus *Cleantis*. The single specimen is part of a collection received through Dr. Edward S. Morse from the Imperial University of Tokyo.

Family IDOTHEIDÆ.

Genus CLEANTIS Dana.

CLEANTIS JAPONICA, new species.

Body narrow, elongate, about four and a half times longer than its greatest width, $18\frac{1}{2}$ mm.: 4 mm. Surface somewhat granulate; color light brown, with longitudinal stripes of dark brown, arranged in five bands, the median and the outer lateral bands being wide, and the inner lateral bands narrow.

The head is $3\frac{1}{2}$ mm. wide and $2\frac{1}{2}$ mm. long; its anterior margin is excavate in the center. The eyes are much wider than long, and placed laterally, with only a portion showing in a dorsal view; they are situated on the anterior half of the lateral margin. The first antennæ are composed of four articles, the terminal one of which is the flagellar article; they extend to the end of the second article of the peduncle of the second pair of antennæ. The basal article is furnished with a small tubercle about the center. The second antennæ have the first article of the peduncle short and inconspicuous in a dorsal view; the following four articles have a carinate process along the inner, ventral side. The fourth and fifth articles are subequal and are a little longer than the second and third, which are approximately equal. The flagellum consists of a single clavate article, about the length of the last peduncular article, and a minute terminal one. The maxillipeds have a palp composed of five articles.

The first three and the last three segments of the thorax are subequal in length, each being about $1\frac{1}{2}$ mm. long; the fourth segment is a little longer than any of the others, being 2 mm. in length. Epimera are present on all the segments except the first; on the second and third segments they are narrow and bilobed and extend only half the length of the lateral margin. They are narrow also on the fourth segment and extend three-fourths the length of the lateral margin. On the last three segments they are wide plates, with the outer post-lateral extremity acutely produced beyond the posterior margin of each segment.

The abdomen is composed of four segments, or three short segments anterior to the long terminal segment. There is a suture on either side of the terminal segment indicating another partly coalesced segment. The terminal segment is 6 mm. long and $3\frac{1}{2}$ mm. wide; it is rounded posteriorly. On its dorsal side the posterior third portion of the segment is obliquely flattened, and has a large median boss, surmounted by a tubercle.

The first three pairs of legs are prehensile, the first pair having a larger and more inflated propodus; they are directed anteriorly. The fourth pair of legs is much shorter than any of the others and folds back laterally. The following three pairs are ambulatory, increasing slightly in length and directed posteriorly.

Only one specimen, a female, was collected in Japan.

The type is in the United States National Museum, Cat. No. 43133.

FIG. 1. *CLEANTIS*
JAPONICA. X 3.
(DRAWN BY MISS V.
DANDRIDGE.)

In addition to the new species, two other species of *Cleantis* have been described from Japan, *C. isopus* Miers¹ and *C. strasseni* Thielemann.² The present species is, however, closer to *C. occidentalis* Richardson from Magdalena Bay, Lower California. It differs from *C. occidentalis* in lacking the groove on the posterior portion of the anterior part of the terminal abdominal segment, which is elevated above the posterior fourth part of the segment, and in the presence of a boss surmounted with a tubercle in the center of the depressed area at the posterior extremity of the terminal segment.

The narrow, elongate form of the body, with sides almost parallel and the disposition of the legs would seem to place this species among the tube-dwelling forms. *Cleantis tubicola* Thomson was found in a tube formed of a "hollow stem of some marine or littoral plant."

¹ Journ. Linn. Soc. London, Zool., vol. 16, 1883, pp. 80-81, pl. 3, figs. 9-11.

² Abhandlungen der math.-phys. Klasse der k. Bayer. Akademie der Wissenschaften, II. Suppl., vol. 3, 1910, pp. 67-69.

Cleantis planicauda Benedict, *Cleantis linearis* Dana, *Cleantis granulosa* Heller, and *Cleantis occidentalis* Richardson also have the narrow body and short fourth pair of legs. The tube-dwelling habit is perhaps common to all these species.

Owing to the differences in the shape of the body, which is broader and more flattened, and in the character of the legs, and to the fact that the abdomen is composed of but two segments, *Cleantis isopus* Miers should not be retained in this genus. I suggest a new genus for its reception, with the name *Cleantiella*.

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ON AN IMPORTANT SPECIMEN OF EDESTUS; WITH DESCRIPTION OF A NEW SPECIES, EDESTUS MIRUS.

By OLIVER PERRY HAY,

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The fine specimen of *Edestus* here described, and now the property of the United States National Museum (Cat. No. 7255), was discovered about 18 years ago by a miner of coal at Lehigh, Webster County, Iowa. Through the intelligent interest of Mr. R. A. Peterson, of Lehigh, the specimen was recently sent to the United States National Museum for examination, and for this purpose it was placed in the hands of the writer. From correspondence with Mr. Peterson it has been learned that the remains were discovered in the black shale which overlies the bed of coal that is locally known as the Tyson seam, and at a depth of 165 feet from the surface. From the coal the specimen was separated by a thin layer of sandstone. Further remarks on the geological position of this coal will be made below.

The specimen so fortunately discovered represents apparently a species hitherto unknown; but what is of still greater importance is the fact that it appears to explain the relation of the objects known by the name of *Edestus* to the body of the animal that bore them, and we can hardly doubt that the same explanation will apply to the still more remarkable objects known as *Toxoprion*, *Helicoprion*, and *Lissoprion*. Among those who have occupied themselves in the study of the straight, or bent, or coiled structures which bear the names mentioned, there has been much dispute regarding the position which they had in the body, especially as to whether they belonged in the mouth or in the neighborhood of some of the fins. In a paper published not long ago¹ the writer advocated the proposition that the toothed shafts of *Edestus* and even the toothed whorls of *Helicoprion* had been produced in front of some of the median fins of sharklike animals. In the presence of the specimen here described this fine theory vanishes, for the remains seem to indicate distinctly that the tooth-bearing shafts of *Edestus* belonged to the region of the mouth and nowhere else.

¹ Proc. U. S. Nat. Mus., 1909, vol. 37, pp. 43-61.

The remains consist, as interpreted, of two tooth shafts, one belonging to the upper jaw, the other to the lower; a part of the lower jaw, and the anterior end of the cranium. There seem to be few or no remains that represent the upper jaws or palato-quadrato arch. As is too often the case, the absence of parts that might have been secured is to be regretted. On the left of the block of shale, as represented in plate 1, the cranium extends to the edge, and there is no doubt that it continued into the block adjacent. Probably near by, in other directions, there were scattered portions of the skull. Of less importance is the fact that the apices of some of the teeth were lost after the block was split.

The parts, except the teeth and the shafts bearing them, are composed of calcified cartilage. The natural surface of most of this appears to be somewhat regularly pitted, and this pitting is believed to be due to the presence of shagreen scales, each of which seems to have had a central depression. The shaft that belonged to the upper jaw has a greater diameter than that pertaining to the lower jaw. It is also longer and not so strongly curved. The upper shaft has a length of about 185 mm., but a portion is missing from the front and possibly a fragment is gone from the hinder end. The diameter about the middle of the length is 32 mm. The lower shaft has a length of about 150 mm. The diameter is 26 mm. In the upper shaft six teeth are distinguishable, but one is missing from the front end, while two others are seen in section on the left-hand edge of the block (pl. 1, 16, 17), but do not show in the figure.

The teeth have a height of about 28 mm., in a straight line from the apex to the middle of the base. One margin, the anterior, is convex, the other concave. Each margin possesses about 25 denticulations, those of the anterior border being slightly larger. Most of the denticulations are simple, but a few of them have one or more notches near the summit. The hinder part of the lower shaft (pl. 1, 3), including two teeth, had, at the time of burial, suffered dislocation. One of these teeth is seen at 4 (pl. 1 and pl. 2, fig. 2); the other lies under the fifth tooth of the upper shaft and was found by digging through the block from the other side (pl. 2, fig. 2, 18). It is evident that the hinder segments of the shaft had not yet become thoroughly consolidated and that maceration and a slight disturbance had led some displacement. On the upper border of the shaft, behind the fifth tooth, is a groove into which the base of the displaced sixth tooth had fitted. Counting the two displaced teeth, there would be seven in the lower shaft. However, in the excavation made from the underside of the block, there is seen a tooth (pl. 2, fig. 2, 19) that is free from any part of a shaft. It appears possible that this tooth belonged behind the one indicated by the numeral 4 and had not yet

developed its portion of the shaft. The hinder end of the detached portion of the shaft is irregular, as if some part had been eroded away.

Figure 1 of plate 2 represents the right half of the block that inclosed the specimen, while figure 2 presents a view of the teeth that were exposed by digging through from the underside of the block. In figure 1 are seen impressions of the teeth of the lower shaft and three of those (5, 6, 7) of the upper shaft. In the depression which contained the lower shaft is seen a fragment, 2, of the latter, which split off from the main portion. Behind and below this depression is seen a large mass of calcified cartilage, which evidently belonged to the lower jaw, including the symphysis. The upper and anterior part of this, 8, forms a part of the bottom of the depression mentioned and must have passed, partly at least, on the right-hand side of the shaft, which would be the upper side on plate 1. Below and behind this there is another mass, 9, which was probably in contact with the left side of the shaft, but in the fossil does not quite reach it (pl. 1) on account of some distortion or shoving before burial. At 10, plate 2, is seen another part of the lower jaw. This ascended to the point indicated by 7, as is shown by the impression on the matrix. It overlay, that is, passed to the right of, the fragment of the lower shaft and over the teeth 11 and 12, which point forward from the hinder edge of the block. What appears to be a continuation of this cartilage is seen at 13, plate 1, passing under (to the left of) the tooth 6. This cartilage does not appear to be a part of that which supports the two teeth 11 and 12, for there is a thin layer of matrix between them. Nevertheless, it seems probable that these teeth belonged to one of the jaws, upper or lower. Still another tooth resembling these and having its apex pointed in the same direction is seen at 20, plate 2, figure 2. None of these three is attached to a shaft, and they are straighter than are the teeth of the shafts. The exposed surface of the bases of these teeth is rough and appears to indicate that some part had been broken or eroded off.

Returning to the lower jaw, it is to be observed that the symphysis appears to have been at least 85 mm. long, occupying the full length of the cartilage present. Since the lower shaft was developed along this symphysis, the latter, as a bed for the former, might be expected to be considerably elongated.

Above the upper shaft is seen a mass of calcified cartilage, which is regarded as having belonged to the snout and extending about as far backward as the orbit. It is even possible that a part of the orbit is included. Below the numeral 14, plate 1, is a deep pit, which is thought to be the nasal pit of the right side. It is surrounded by a pavement of shagreen scales, each of which presents a central depression. There seems to be a channel running forward from it to the

border of the cartilage of the snout. Above this pit there was an overhanging ridge that ran forward from the pit about 15 mm. and backward from it about 35 mm. In cleaning the specimen this ridge split off and it was not replaced before photographing, in order that the pit might be more distinctly shown. It seems not improbable that the region below the hinder half of the ridge represents the orbit. The process, 15, behind the supposed nasal pit, may be the antorbital process.

In the dried skull of a shark at hand the interorbital region is 50 mm. wide. What may be the corresponding region of this *Edestus*, possibly a still larger animal, has been compressed until it is only 10 or 15 mm. thick. Hence, the limits of the orbit may well be difficult to distinguish. Moreover, as a result of the compression suffered, the cartilage has been more or less fractured and faulted. The upper border of the cartilaginous mass forms a smooth edge, except just over the nasal pit, where some of it has been broken off. Where the matrix has been removed from the left side of the upper shaft the latter is seen to be covered by a layer of cartilage. This is supposed to be the left side of the skull pressed against the shaft. It is possible that a part of left palato-quadrate element is included.

Behind the tooth indicated by 6, plate 1, the upper shaft is covered with a mass of iron sulphide. This swelling probably does not represent any element of the skull. Beneath it, 7, is the base of a tooth, the impression of whose apex is seen at 7, plate 2, figure 1. On the broken hinder border of the block, at 16 and 17, are seen cross sections of two other teeth, which seem to belong to the upper shaft. In case the relations of the shaft to the cranium are such as they were in life, the shaft must have extended far backward in the roof of the mouth.

It is important to note that there is no indication of a pair of shafts in either the upper or the lower jaw. This condition is in harmony with the fact that all the tooth-bearing shafts that have been discovered have been bilaterally symmetrical. Nor are there in this Iowa specimen any signs of wear on the teeth, such as one would expect to find. The specimen appears therefore to prove that the objects which alone have hitherto represented the genus *Edestus* were produced in the mouth of the shark and that there was a single one above and another below and that these played the one against the other more or less closely. It is pleasant to credit Dr. C. R. Eastman with having in various papers advocated the idea that the tooth shafts of *Edestus* and related genera belonged in the mouth. He has been disposed, however, to believe that there was a pair of them in one jaw or the other, probably the upper. The structure of these shafts shows that each must have been produced by the consolidation of a median row of symphysial teeth. As, after the manner of sharks, younger teeth were added to the hinder end of the series the older

teeth were pushed forward and out of the mouth, but instead of remaining free from the adjacent teeth and falling away, their bases cohered to form a shaft. In the species before us the outer end of the lower shaft was directed forward and downward, while the upper shaft was directed forward and upward. It is entirely improbable that the tooth found at the outer end of each of these shafts was the first tooth the animal possessed. One must therefore believe that, although the outer segments of the shaft appear to be very solidly united, those of the older teeth did, in succession, lose their hold on the younger ones and become detached.

This Iowa specimen enables us to determine which end of the shaft is the anterior and in what order the new segments were added, and here the opinion held by most writers is reversed. That end which in a former paper the writer regarded as the front end is in reality the hinder end. The bases of the crowns of the teeth are drawn out backward, not forward. The tooth which is seen at the left end of the figure of *Edestus crenulatus*¹ is not the last tooth that was formed, but the first, at least the first of those present. In his description of the type species of the genus, *E. vorax*, Doctor Leidy² correctly judged which was the anterior end of the fragment that he had, but he supposed that it was a part of the maxilla of some fishlike animal. Dr. J. S. Newberry,³ in his description of *E. giganteus*, stated that the teeth, or denticles, were prolonged backward and downward into a simple point. In this opinion, as shown by the specimen at hand, he was correct. However, on the preceding page Newberry writes: "Again, *E. heinrichsi* is nearly straight; a foot long, rounded and massive at one end, thin and acute at the other; but the succession of denticles was by additions to the acute end, which must have been behind," etc., a statement that contradicts the one just referred to regarding the direction in which the enamel is prolonged. In describing the manner of growth of the mass,⁴ he said: "The numerous disconnected segments of *Edestus heinrichsi*, furnished me by Mr. Butts, seem to prove conclusively that the spine was elongated by the addition of a sheath, carrying a denticle, to the extremity and underside of the preexisting series." It is to be recollected that Doctor Newberry believed that the mass was a dorsal defensive spine.

Like Newberry, the present writer held that the last-formed channeled tooth base was applied to the border of the shaft opposite the one bearing the teeth; but now it is necessary to believe that the newer tooth base was laid down in the trough of the one immediately

¹ Proc. U. S. Nat. Mus., vol. 37, 1909, pl. 12, fig. 1.

² Journ. Acad. Nat. Sci. Phila., ser. 2, vol. 3, p. 160.

³ Pal. Fishes, N. A., p. 225.

⁴ Idem, p. 223.

preceding it. Furthermore, since the troughlike tooth bases last produced are much shorter than the older ones, it must be that the latter continued for a long time to grow backward. This resulted in maintaining and increasing the size and the strength of the shaft.

As stated, the base of the crown of each tooth is prolonged backward. Now if we apply this rule to the tooth masses of *Helicoprion* and *Lissoprion*, we are led to the absurd conclusion that the very small teeth of the innermost coil are the ones that were last formed. The same remark will apply to *Toxoprion*. It becomes evident, therefore, that there existed some important differences, other than that of form, between *Edestus* and the genera just named.

As will be seen from the figures, many small particles are scattered over the block below the lower shaft. These appear to consist mostly of particles of decayed calcified cartilage, but there appear to be occasional scales of shagreen. Here also are seen two teeth which Doctor Eastman, on examining the specimen, recognized as belonging to the *Orodus* type. It is possible, not to say probable, that these teeth were originally attached to one of the jaws of the *Edestus*. If they were a part of the armature of *Edestus*, this fact would go far toward confirming Doctor Eastman's belief that *Edestus* had been derived from some form like *Orodus* or *Campodus*. It might be that from a shark having in the upper or the lower jaw two rows of symphyseal teeth there might arise a form having but one row, enlarged and especially modified through the reduction of the other row of the pair. Something like this is seen in the usually unpaired and greatly developed canine tooth of *Monodon*. In assigning these *Orodus*-like teeth to the jaws we must consider the fact that the teeth indicated on plate 1 by the numerals 11 and 12 probably belong on the upper jaw.

The remains here described appear to represent a species hitherto unknown. It closely resembles *Edestus minor* Newberry. It differs from the latter in having the tooth shafts more strongly bent and in having the apices of the teeth more acuminate. In *E. minor*, as in the present species, the front border of each tooth is convex, but the hinder border is either nearly straight or only slightly concave for most of the length, while near the apex it becomes convex. In the new species the whole posterior border is concave and the apex of the tooth is relatively slender. It appears also that the denticulations of the teeth of *E. minor* are at right angles with the border, while in the present species they are directed distinctly toward the apex.

I propose to call the species represented by the above-described remains from Lehigh, Iowa, *EDESTUS MIRUS*.

As already stated, this specimen was found in the black shale overlying the Tyson seam. This seam belongs to the Des Moines stage of the "Coal Measures." For details regarding the geology of this region

the reader may consult the report on this county made by Prof. Frank A. Wilder¹ and a report on Iowa coals by Mr. Henry Hinds in volume 19 of the same survey. I am informed by Mr. David White, of the United States Geological Survey, that the Des Moines stage belongs either to the uppermost Pottsville or to the basal Allegheny. This means that the species here described lived in the earlier part of the era during which the coal beds of the eastern half of the United States were deposited. The type of *E. minor* found in Parke County, Indiana, appears to have lived at about the same time. *Edestus heinrichi* is found in coal mines that appear to have approximately the same level as those mentioned, but are possibly a little higher in the series.

It may be proper to note here that there is a specimen of *E. heinrichi* in the collection of the Iowa State Historical Society at Des Moines. It was found at Mystic, Appanoose County, Iowa.

There seems to be no certain evidence that any species of *Edestus* occurs in the upper half of the "Coal Measures."

The sharks that belonged to the genus *Edestus* must have presented a singular appearance with their straight or bent tooth shafts protruding from their mouths, especially the species *E. vorax* and *E. giganteus*, in which these organs attained a remarkable size. Nevertheless the individuals of *Helicoprion* and *Lissoprion* were still stranger objects, since each must have carried in front of the mouth a pair of weapons resembling circular saws, each 9 or 10 inches in diameter. Karpinsky's figure has seemed grotesque enough, but it probably tells only half the story. It remains now for some one to explain how the toothed whorls of *Helicoprion* were produced and attached. That of the lower jaw must have formed its segments above and in close contact with the symphysis of the lower jaw. At the same time the earlier-formed end of the last turn must have lain below the symphysis, with the apices of its teeth pointing toward this. According to Karpinsky's figure, there was the space of only 15 mm. between the apices of these teeth and the base of the shaft. The ligaments joining the right and left members of the lower jaw may be supposed to have passed in this space, besides the skin and the tissue underlying the shaft. It is, on the other hand, possible to believe that the shaft itself formed the bond of union between the two jaws and that nothing but the skin intervened between successive turns. A similar but more difficult problem confronts us in the case of the upper whorl. It will not do to push the whorl out in front of the snout, as Karpinsky has done, by making the younger part of the spiral relatively straight, for its last turn would stand out far from the preceding ones, and of this there is no evidence or probability. Besides, there would have been the same demand for a little curved portion while the first turns were being formed. The determination

¹ Geol. Surv. Iowa, vol. 12.

of the position of the upper shaft with relation to the symphysis of the upper jaws and to the snout of the animal is more difficult, but the present writer has now little doubt that nature had the problem solved in a way that permitted the presence of a spiral of teeth above and another below.

EXPLANATION OF THE PLATES.

[All the figures are three-fourths the natural size.]

PLATE 1.

1. Upper tooth shaft.
2. Lower tooth shaft.
3. Detached portion of lower shaft.
4. Seventh tooth of lower shaft.
- 5-7. Fifth, sixth, and seventh teeth of the upper shaft.
9. Depression occupied by left side of lower jaw.
- 11, 12. Smaller teeth supposed to have belonged to some of the jaws.
13. Fragment of cartilage supposed to belong to the right half of lower jaw.
14. Placed just above the nasal pit.
15. Process of cartilage, possibly the antorbital process.
- 16, 17. Position of two broken teeth belonging to the upper shaft.

PLATE 2.

figure 1.

2. Fragment of lower tooth shaft.
- 5-7. Impressions of teeth of upper shaft, indicated as on Plate 1.
8. Part of right side of lower jaw.
9. Part of the left side of the lower jaw.
10. Impression in the shale of part of the right side of the lower jaw.

figure 2.

4. The tooth indicated by the same numeral in Plate 1.
12. The tooth indicated in Plate 1 by 12.
18. The sixth tooth of the lower shaft.
19. A loose shaft tooth.
20. A tooth supposed to belong to one of the jaws.

EDESTUS MIRUS.

FOR EXPLANATION OF PLATE SEE PAGE 38.

DESCRIPTIONS OF NEW SPECIES AND GENERA OF LEPIDOPTERA, CHIEFLY FROM MEXICO.

By HARRISON G. DYAR,

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The following apparently undescribed species have mostly been received from Mr. Roberto Müller, of Mexico City, for identification. I have been assisted in placing some of the species by Sir George F. Hampson and Mr. William Schaus. Their assistance is specially acknowledged under each heading. All the species are from Mexico except in one family, the Cochliidiidæ, where species from Costa Rica and Brazil are described.

Superfamily PAPILIONOIDEA.

Family SATYRIDÆ.

Genus EUPTYCHIA Hübner.

EUPTYCHIA PERTEPIDA, new species.

Dark gray; a reddish shade over the middle of the fore wing, especially marked along the median vein and the bases of veins 3 and 4; a diffused band of erect scales across the disk beyond the median vein, cut by the reddish veins. Hind wing with the diffused reddish shade outwardly; two elongated blackish spots on the margin between veins 3 to 5. Beneath the fore wings are reddish on the lower half; two brown lines cross the disk, and there is a row of submarginal lunate dusky spots. Hind wing brown-gray, the two median lines wavy and irregular, with a faint similar subbasal line, the outermost line followed by a bright reddish shade. A submarginal row of silvery scaling in a waved and broken line, crossing two velvety black oval spots on the margin, on which the silver forms irregularly geminate spots. Expanse, 35 mm.

Female similar, but the whole discal area of fore wing overspread with bright brownish red, the lines of the underside slightly indicated, the sex mark absent. Hind wings red on the outer third. Underside as in the male. Expanse, 40 mm.

Cotypes.—One male, two females, No. 13852, U.S.N.M., Mexico City, Mexico, November, 1910 (R. Müller).

Family NYMPHALIDÆ.

Genus PHYCIODES Hübner.

PHYCIODES CORACARA, new species.

Black above, the wings with white points; fore wing with four white spots beyond the cell, the upper pair on costa, the lower pair touching them, but more outwardly placed; two white points in the cell; two in submedian interspace; a larger one above vein 2; an outer row of seven small spots in an even curved line; a rather large lunule submarginally above vein 3; fringe checkered with white. Hind wing with the outer row of points and checkered fringe. Beneath the fore wing is as above, the spots somewhat enlarged, the ground color grayish. Hind wing with the disk pale yellow, the outer margin blackish shaded; a red mesial band composed of black-edged spots and one yellow one in the cell; a double subbasal black bar, stained with red; two rows of black dashes, nearly connected, running across the yellow disk, the inner one approximated to the mesial band, the outer free; a row of white points, inclosed by the blackish marginal shading; two submarginal white crescents; a terminal red line on both wings. Body pale yellow beneath, with lateral yellow spots; legs stained with reddish. Expanse, 30 mm.

Cotypes.—Ten specimens, No. 14029, U.S.N.M., Sierra de Guerrero, Mexico, July, 1910 (R. Müller); Iguala, Guerrero, Mexico, 2,400 feet, June, 1906 (W. Schaus).

Mr. Schaus has kindly examined a specimen and informs me that the species is undescribed.

Family RIODINIDÆ.

Genus CARIA Hübner.

CARIA MELINO, new species.

Dark leaden gray with small black spots which have green metallic luster; fore wing with a spot in cell; a row of small ones beyond and a double marginal row; hind wing with distributed spots, hardly forming rows, the double marginal rows almost forming lines, with a coppery reddish tinge between and at base of fringe. Beneath dull red, the spots repeated and more distinct, being generally distributed over base of fore wing as well as hind wing; a broad dark shade over apex of fore wing and narrowly along margin of hind wing; inner margin of fore wing gray. Expanse, 22 mm.

Cotypes.—Two males, No. 14282, U.S.N.M., Tehuacan, Mexico, September, 1910, June, 1911 (R. Müller).

CARIA STILLATICIA, new species.

Ground color red-brown, overlaid with blackish on inner (lower) half of fore wing and basal three-fourths of hind wing; veins broadly lined with leaden black which has a leaden blue reflection in oblique light; spots small, black, in about five rows, the next to the last row being elongate and replaced below vein 3 by a bar of metallic blue. On the hind wing the spots are less distinctly in rows, but the blue-leaden half-band is present and there is also a longer similar band close to the margin. Beneath of a bright brown-red, the black spots repeated and distinct, each with a patch of leaden-silvery scales, which form a nearly continuous line along the margin of both wings; fringe dark leaden gray; costa of fore wing gray with five small yellowish dashes; inner margin of hind wing gray. Expanse, 26 mm.

Type.—One male, No. 14283, U.S.N.M., Sierra de Guerrero, Mexico, July, 1911 (R. Müller).

Family LYCÆNIDÆ.

Genus THECLA Fabricius.

THECLA PRIMNOZA, new species.

Wings black above, shaded with light blue on basal two-thirds of inner margin of fore wing below cell, over most of hind wing, except apex and a row of marginal spots; a blue line at base of fringe, which is white-tipped; long tail at end of vein 2 white-tipped. Costa of fore wing strongly angled near base in both sexes; male with a band of dark gray scales extending subcostally, the band nearly as long as half the length of the wing. Beneath dark gray; fore wing with a wavy white line beyond the middle, which is broken at vein 2 and lost in the whitish inner shading below; a submarginal row of whitish lunules, filled outwardly with whitish above and with blackish below. Hind wing gray on the basal third, washed with whitish beyond; a neat white crescent in the cell; three white lunules below and beyond, followed by a curved line of lunules across the wing at about the middle; another line at outer third, less distinctly lunular and edged without with dark; a black dot with red within above vein 2; some gray clouding before the termen; a terminal dark line; fringe whitish. Expanse, 30 mm.

Cotypes.—One male, one female, No. 14277, U.S.N.M., Misantla, Mexico, June, 1911 (R. Müller); Santa Rosa, State of Vera Cruz, Mexico, May, 1906 (W. Schaus).

This is allied to *T. primno* Godman and Salvin, of which the male is unknown. The very peculiar male sex mark will readily distinguish this group.

THECLA ZENaida, new species.

Black, the male overspread with metallic blue except the margins of the wings; an elliptical brown sex mark occupying the outer half of the cell; female with pale blue at base of fore wing and overspreading most of hind wing except the costal area. Beneath dark brown-gray; fore wing with a fine white submarginal lunulated line, terminating at vein 2, preceded by a broad dark gray shade; hind wing with a dark gray shade at base and subterminally; an inner lunulated white line which forms a number of irregular marks at the end of the cell; an outer irregularly lunulated line across the wing; a submarginal wavy dark line in a whitish field, with a black dot preceded by red above vein 2; edge white, with a black line at base of fringe; long tail tipped with white. Expanse, 29-31 mm.

Cotypes.—One male, one female, No. 14278, U.S.N.M., Santa Rosa, State of Vera Cruz, Mexico, August, 1906 (W. Schaus).

THECLA GREPPA, new species.

Black above, the fore wings dark blue on basal three-fourths in and below cell, the hind wing blue except extreme margin and costal area; long tail at vein 2 and short one at vein 3 tipped with white; sex mark double, the upper portion generally appearing slaty gray, the lower blackish brown. Beneath light silvery gray, nearly white; on fore wing a slightly bent white line beyond the middle preceded by a gray and red shade, which is cut by the white veins; the line stops at vein 2; submarginal line slender, gray, cut by the veins; hind wing with a mesial row of light red spots of irregular sizes, the second from the costa small and placed somewhat inward, the two next the inner margin forming a line and placed somewhat outwardly; a submarginal gray line, broken into lunules, covering a red spot with black center above vein 2; another red spot at anal angle; slight gray spottings along the margin. Expanse, 29 mm.

Cotypes.—Three males, No. 14279, U.S.N.M., Misantla, Mexico, June, 1911 (R. Müller); Santa Rosa, State of Vera Cruz, Mexico, May and August, 1906 (W. Schaus).

This species is allied to *T. philinna* Hewitson, but is much whiter below.

Family HESPERIIDÆ.**Genus HETEROPIA Mabille.¹****HETEROPIA CYLEDIS, new species.**

Bronzy brown, the wings above washed with yellowish at base, on the fore wing to the middle, on the hind wing nearly throughout,

¹ Not *Heteropis* Carter, which has precedence.

excepting only on costa and narrowly on outer margin; fringes checkered black and white; on fore wing a row of four whitish subhyaline spots from middle of costa directed toward tornus, the costal spot divided by a vein, the one in the cell indented; a spot between veins 3 and 4 and a little one beyond; an oblique subapical row of three small ones. Beneath the spots are repeated; the wing is gray at the tip, with streaks of white in which are black irrorations; a yellow shade on inner margin. Hind wing dark gray; a broad submarginal white band, distinct only centrally, fading out toward costa and anal angle, irrorated with gray; in the basal field are angular black markings forming a subcostal bar crossed by a median bar, with a branch running along the lower part of the white submarginal band. Expanse, 53 mm.

Type.—Male, No. 14220, U.S.N.M., Tehuacan, Mexico, April, 1911 (R. Müller).

Genus THRACIDES Hübner.

THRACIDES URIDON, new species.

Black above, the body and bases of both wings shot with bright metallic blue. Fore wing with a whitish patch in the center, pointed outwardly. Beneath dark brownish gray; costæ of both wings white at base; fore wing with an oblique white band, broadening below, the ground color darker before and beyond it; a curved subapical dark bar. Hind wings with discal and median curved dark bands. Expanse, 49 mm.

Type.—Female, No. 14221, U.S.N.M., Guerrero, Mexico, March, 1911 (R. Müller).

Genus THORYBES Scudder.

THORYBES THEDEA, new species.

Brown; fore wing with a broad black bar near the middle, not reaching costa nor inner margin, indented without at veins 2 and 3; two white specks beyond it in the cell and one subcostally; four subapical hyaline-whitish spots in an oblique row; a small black-edged spot above vein 3; a double one above vein 2; a double black spot above vein 1, its upper portion small and moved outward. Hind wing with traces of an outer mesial row of dark spots. Beneath on the fore wing the spots are more faintly repeated; inner margin broadly yellowish; hind wing with an outer mesial narrow dark band, faintly followed by yellowish spottings. Expanse, 40 mm.

Type.—One female, No. 14274, U.S.N.M., Tehuacan, Mexico, June, 1911 (R. Müller).

Genus STAPHYLUS Godman and Salvin.

STAPHYLUS LITUS, new species.

Black; the wings with a faint bronzy reflection, without markings. Head and collar with some cupreous scales. Beneath black with slight greenish reflection; palpi below, pectus and a double ventral line on abdomen white; a few white scales in the fringe at apex of fore wing. Scales in the costal fold yellowish. Expanse, 25 mm.

Type.—One male, No. 14275, U.S.N.M., Sierra de Guerrero, Mexico, June, 1911 (R. Müller).

Genus BUTLERIA Kirby.

BUTLERIA EA, new species.

Black above; fore wing with a minute white speck in the cell, an elongate one below, two beyond subcostally and an outer curved row of four, none above vein 4; hind wing with a mesial row of small specks, one below vein 2 distinct. Beneath a little powdered with brassy; white spots larger and more distinct; on the fore wings as above; on the hind wings a spot in cell; a mesial row of four, the upper two elongate and slanting in opposite directions; an outer row of six, the one near anal angle moved inward. Expanse, 19 mm.

Cotypes.—Two males, No. 14276, U.S.N.M., Sierra de Guerrero, Mexico, June, 1911 (R. Müller); Oaxaca, Mexico (W. Schaus).

Family PAPILIONIDÆ.

Genus BARONIA Salvin.

BARONIA BREVICORNIS Salvin.

Besides the form of the female resembling the male, and which is figured in the "Biologia Centrali-Americana" there are before me two very dissimilar dimorphic forms, which seem worthy of description.

Dimorphic form EUSEMNA, new.

Wings fulvous above, the veins lined with black; fore wing with the costa black, a broken bar across the cell to vein 3 and one at end of cell; apex and outer margin black; three yellow elliptical spots in the interspaces beyond the cell, one below the costa, three in a line below vein 8, and four submarginal, below vein 7. Hind wing with the veins beyond the cell black-lined; a spot between veins 6 and 7; outer margin broadly black with submarginal fulvous spots between the veins. Beneath the fore wing is fulvous on the inner area, the silvery white markings on both wings being as in the typical form.

Type.—One female, No. 14280, U.S.N.M., Sierra de Guerrero, Mexico, June, 1911 (R. Müller).

Dimorphic form *PERONIMA*, new.

Wings black above; two subapical rows of yellow spots on fore wing, the inner of four spots in a line, the outer of four in a very irregular row, no spot above vein 5; hind wing with the submarginal row present above veins 2, 3, and 4, the one below vein 2 double, and a little one farther in above vein 6. Beneath black, all the silver marks toward the base absent; on fore wing a spot in the cell and three outer irregular rows; on hind wing two outer rows of small spots between the veins.

Type.—One female, No. 14281, U.S.N.M., Sierra de Guerrero, Mexico, July, 1911 (R. Müller).

Superfamily SPHINGOIDEA.

Family SPHINGIDÆ.

Genus HYLOICUS Hübner.

HYLOICUS ADUMBRATA, new species.

Gray, edges of collar and patagiae black. Abdomen broadly black on the sides with five elliptical pale-yellow segmentary spots; a narrow dorsal black line; venter gray with a central black line. Head and palpi gray with some black about the orbits. Fore wing gray; a black patch near base on inner margin; a black line above median vein, doubled beyond the cell and four dashes in the interspaces, the upper one joining the apical dash; a submarginal line below vein 4, running obliquely inwardly, edged with whitish without. Hind wing black with gray bands sub-basally, mesially and on margin. Expanse, 85 mm.

Type.—One male, No. 13853, U.S.N.M., Zacualpan, Mexico, September, 1910 (R. Müller).

Genus AMPLYPTERUS Hübner.

AMPLYPTERUS GLOBIFER, new species.

Pale olivaceous ochery; legs brown; vertex of head and a large patch covering patagia olive brown. Fore wing with a large olive-brown patch near base close to inner margin, pyriform, the prolongation directed towards base, the upper edge crossing median vein. Sub-basal and faint double median lines crossing wing; outer line parallel to margin, brown, shading into an irregular shading that covers the outer third of wing; it becomes bluish and dark on inner margin and contains there a bent black line; above this there is a lightening and another at costa, this last squarely cut outwardly by a brown shade. Hind wing dark rose-color except on inner margin, with a broad submarginal brown shade, constricted opposite the sub-

basal indentations of the margin; two mesial shaded lines, most distinct near inner margin, the outer one close to the submarginal shade. Expanse, 115 mm.

Type.—One male, No. 13854, U.S.N.M., Mineras de Zacualpan (near Mexico City), Mexico, August, 1910 (R. Müller).

Superfamily SATURNOIDEA.

Family SATURNIIDÆ

Genus ROTHSCHILDIA Grote.

ROTHSCHILDIA LICHTENBA, new species.

Mouse gray; collar and base of abdomen with a broad white band; sides of abdomen white with a row of red points; a sublateral row of red patches. Fore wing with the inner band angled, white, broad, edged with red within and black without, the latter broken on the angulation, while the white is produced faintly along veins 2 and 3; discal hyaline spot rounded, touching the outer band, edged with white and black; outer band white, strongly crenulate within and edged with black, edged with powdery red without; submarginal space powdered with lilacine on its basal half throughout, the following clay-colored space edged with brown and divided by the veins and intravenular scallops into geminate patches; of these the subapical one contains three black spots; a white line from the apex with two teeth above limits the subapical pale lilacine area. Marginal space white within, clay-colored without, cut by the veins. Hind wing similarly colored, the inner band slight and concave; submarginal clay-colored band nearly filled by dumb-bell-shaped spots, black at their ends, red in the centers, followed by a dark line and little white patches near margin, representing the submarginal white of the fore wing. Expanse, 90 mm.

Type.—One male, No. 13855, U.S.N.M., Salina Cruz, State of Oaxaca, Mexico, September, 1906 (W. Schaus).

This species was determined as new by Mr. Schaus.

Genus AGAPEMA Neumoegen and Dyar.

AGAPEMA COPAXOIDES, new species.

Gray brown, the collar brownish white. Wings darker at the base without distinct inner line; discal mark rosy red, ringed with black, with linear hyaline center; outer line zigzag, linear, blackish, but defined chiefly by the following pale marginal space, which shades again darker to the edge; an apical white dash on fore wing with a crimson and black spot inwardly. On the hind wing the marginal space is less pale and the black zigzag line therefore less distinct. Expanse, 78 mm.

Type.—One specimen, No. 13856, U.S.N.M., Iguala, State of Guerrero, Mexico, 2,400 feet, June, 1906 (W. Schaus).

This species was determined as new by Mr. Schaus.

Genus AUTOMERIS Hübner.

AUTOMERIS MELMON, new species.

Fore wings rather sharply pointed at apex in both sexes. Male yellow, the fore wing with two outer lines of brownish gray spots, both nearly straight; discal mark a ring of spots around a central one; traces of an inner line. Hind wing with the disk ochre yellow, the inner margin pink; round discal ocellus with powdery white and a central white pupil; outer line black, evenly curved; submarginal line and fringe red-brown. Body dark yellow, the abdomen with dorsal dark rosy shading. Expanse, 51 mm.

Female dark rosy brown, the fore wing nearly uniform; inner and outer lines and discal mark indicated by lines of white scales; submarginal line a slightly lighter shade with a deepening of the ground color within. Hind wing with the margin rosy instead of yellow and the submarginal reddish shade broader; otherwise as in the male. Body dark rosy. Expanse, 56 mm.

Cotypes.—Two males, one female, No. 13857, U.S.N.M., Mexico, without exact locality, July 26, 1906 (R. Müller, Nos. 148 and 527).

AUTOMERIS DANDEMOM, new species.

Male yellow, female dark rose color, as in the preceding, but the wings are not so pointed at apex. The submarginal line on fore wings of male is absent, and only faintly indicated in female, the outer line being nearer the margin than in *melmon*. Hind wings with the pink shading on inner margin spreading largely over the disk in both sexes, also the markings similar to those of *melmon*. In the female the submarginal band is scarcely darker than the marginal area.

Cotypes.—Four males, one female, No. 13858, U.S.N.M., Cuernavaca, Mexico, July and August, 1906 (W. Schaus).

Mr. Schaus took a specimen of this species to London for comparison and returned it without comment.

AUTOMERIS COLENON, new species.

As in the preceding species, but the lines crenulate and wavy. In the male a zigzag inner line is evident, the discal ringlet of dots is filled in with a brownish shade and there is an irregular wavy submarginal line. In the female the lines are indicated by lines of whitish scales, the outer line strongly crenulate; submarginal line indicated by the limitation of the slightly paler marginal area. Hind

wings of the male with a broad dark rosy shade on inner margin, the other markings as in the preceding species. Female with the disk dark orange, the outer bands and inner shade not strongly contrasted.

Cotypes.—Four males, two females, No. 13859, U.S.N.M., Cuernavaca, Mexico, July, 1906 (W. Schaus).

Mr. Schaus says that the female is in the British Museum under the name *Automeris cogena* Felder, but that it does not agree with Felder's figure.

AUTOMERIS THYREON, new species.

Male brownish tan-color, the fore wing with the inner line distinct, blackish, of three arcs in a line and two strongly dislocated ones; discal mark of arcs in an ellipse with central spot, grayish filled; outer line blackish, of short arcs in a straight line; submarginal line of brownish red spots, distinctly discolorous, in an undulating row. Hind wing with the disk orange-tan, the inner margin broadly dull rose; discal ocellus rather small, black, with central powdering and white dash; outer line black, evenly curved; submarginal line red. Expanse, 47 mm.

Female purple-brown, abdomen dorsally coherous. Fore wing with the basal space and discal lunule broadly brownish ocher, paler than the rest of the wing; outer line of ocher lunules with a dark bordering shade without; a submarginal dark shade. Hind wing ocher with purplish brown shade on inner margin; discal ocellus and outer line black; submarginal line purple brown; fringe red-brown. Expanse 53 mm.

Cotypes.—Thirteen males, two females, No. 13860, U.S.N.M., Cuernavaca, Mexico, June and August, 1906 (W. Schaus).

Mr. Schaus compared the female in London and labeled it "Seems also distinct; nothing like it here."

Genus COLORADIA Blake.

COLORADIA EUPHROSYNE, new species.

Dark gray; body parts nearly black; fore femora with some crimson hairs; antennæ testaceous; fore wing shaded with blackish, except across and beyond cell; lines broad, diffused, of the same dark color; discal spot round, black. Hind wing dark crimson with mesial blackish shade and broad outer border; discal spot round, darker. Beneath both wings crimson with mesial and broad outer bands; discal spots large, rounded, blacker than the bands. Expanse, 62 mm.

Type.—One male, No. 14077, U.S.N.M., Mexico City, Mexico, July, 1910 (R. Müller).

Family CITHERONIDÆ.

Genus CITHERONIA Hübner.

CITHERONIA BELEDONON, new species.

Head and thorax variegated with yellow and vermillion; abdomen vermillion above, with yellow basal segmental bands, yellow below with lateral and subventral vermillion spots. Fore wing gray, the veins lined in red; a submarginal wavy orange-red band, broken above; a yellow spot at base, an angular one in cell and small one below base of vein 2; an outer row of spots between the veins, the two costal ones elliptical, large, and confluent, the ones below veins 4 and 1 moderate, pyriform, the others small, none below vein 5. Hind wing with the ground yellow, the veins lined with red and a red basal shading; a red outer band, nearly pure red in the male, shaded with gray in spots between the veins in the female; a marginal gray band, cut into spots by the red veins, this band broadest and most distinct in the female, but present in the male also. Expanse: Male, 98 mm.; female, 118 mm.

Cotypes.—No. 14215, U.S.N.M., Cuernavaca, Mexico; male, May, 1911 (R. Müller); female, July, 1906 (W. Schaus).

Allied to *C. mexicana* Grote and Robinson, but with the costo-subapical spots larger and paler yellow, the hind wings of the male round and fuller and marked similarly to those of the female.

Genus ADELOCEPHALA Boisduval.

ADELOCEPHALA XANTHOCHROIA, new species.

Orange yellow; fore wing with large sparse purplish strigæ; inner line slender, purplish, curved a little in the cell; discal mark double, the upper spot small, purplish, the lower white, angular, edged with purplish; outer line narrow, straight, from costa before apex to near middle of inner margin; a purplish shade along the fringe of the margin. Hind wing with a crimson patch on inner part of wing from base toward tornus, the inner margin itself yellow like the rest of the wing. Beneath, fore wing with a large black discal patch, containing two white points; an outer line on both wings, distinct only toward the apex. Expanse, 69 mm.

Type.—Male, No. 14028, U.S.N.M., Misantla, Mexico, May, 1910 (R. Müller).

Superfamily BOMBYCOIDEA.

Family SYNTOMIIDÆ.

Genus HYALEUCEREA Butler.

HYALEUCEREA AGYLLOIDES, new species.

White, without markings. The wings are narrow, the fore wing pointed, the apex depressed. Pectinations of the antennæ and eyes black. Expanse, 27 mm.

Type.—Female, No. 13919, U.S.N.M., Orizaba, Mexico, January, 1911 (R. Müller).

Family LITHOSIIDÆ.

Genus NYCTOSIA Hampson.

NYCTOSIA POICILONOTUS, new species.

Front of head gray, vertex orange; disk of thorax orange, tegulæ and patagia gray; sides of thorax below orange and rosy; abdomen blue-black, the basal segment above rosy, the tip orange. Fore wing leaden gray. Hind wing rosy red with narrow costal and outer margin of dark gray. Beneath as above. Expanse, 40 mm.

Type.—Male, No. 14213, U.S.N.M., Mexico City, Mexico, June, 1911 (R. Müller).

Genus AGYLLA Walker.

AGYLLA IDOLON, new species.

White, head and collar dull ocher; fore wings gray beneath; legs and abdomen beneath tinged with dull ocher. Expanse, 27–30 mm.

The male has the antennæ with bristles and cilia; no secondary sexual characters.

Cotypes.—Male and female, No. 14272, U.S.N.M., Mexico City, Mexico, June and July, 1911 (R. Müller).

ARDONIPSA, new genus.

Fore wing with vein 5 present; hind wing with vein 5 present; fore wing without an areole; veins 7–8 and 9–10 on separate stalks; hind wing with vein 5 from middle of cell.

Genotype.—*Ardonipsa melas*, new species.

ARDONIPSA MELAS, new species.

Fore wing dull black; hind wing and body blue-black. Beneath black, with a greenish-blue reflection, stronger than above. Expanse, 26 mm.

Type.—Male, No. 13953, U.S.N.M., Cuernavaca, Mexico, July, 1906 (W. Schaus).

The specimen was kindly examined by Sir G. F. Hampson, who labeled it "New genus and species near *Ardonio*."

Family ARCTIIDÆ.

Genus HALISIDOTA Hübner.

HALISIDOTA NIMBIFACTA, new species.

Pale straw-yellow, the hind wings yellowish white, semihyaline. Fore wings opaque, pale yellow, the markings pale brown, faint and nearly obliterate; these are in the form of chainlike bands, with a dark discoloration at the end of the cell and a small speck in the submarginal band between veins 5 and 6. The markings are much as in *Halisidota thyophora* Schaus but very much fainter as well as being more regular and chainlike. Expanse: Male, 22 mm.; female, 30 mm.

Cotypes.—Two males, seven females, No. 13844, U.S.N.M., Santa Rosa, State of Vera Cruz, Mexico, July, 1906 (W. Schaus); Guadalajara, Mexico (Schaus collection).

HALISIDOTA NIMBISCRIPTA, new species.

Pale straw-color. Antennæ of the male broadly pectinated. Fore wing pointed, marked with many fine pulverulent confused lines; these consist of the ordinary transverse catenulate markings but confused and confluent; the submarginal and marginal rows are most distinct, the former a line of cusps, the latter of small ringlets; a darker dot above vein 5; a slight yellow shading through the cell and outwardly from it. Expanse, 45 mm.

Type.—Male, No. 13920, U.S.N.M., Iguala, State of Guerrero, Mexico, 2,400 feet, July, 1906 (W. Schaus).

Mr. Schaus determined this species as new and says it is near *Halisidota nebulosa* Rothschild.

HALISIDOTA CARINATOR, new species.

Allied to *cinctipes* Grote and *schausi* Rothschild, but smaller and more darkly colored. The ground color of the fore wings is ochre yellow, not the pale whitish ochery of the two species mentioned, while the hind wings are of a strong ochre yellow color throughout, not semihyaline whitish with yellow wash on the inner area. The markings are as in *schausi*, a little darker and more distinctly limited by their dark borders. Expanse, 37 to 47 mm.

Cotypes.—Seventeen males, eight females, No. 13681, U.S.N.M., Orizaba, Mexico, April 11, 1906 (R. Müller), March 13, 1908 (F. Knab); Cordoba, Mexico, March 13, 1908 (F. Knab); Jalapa, Mexico (Schaus collection); Coatepec, Mexico (Schaus collection).

The species runs into a dark form resembling *atra* Druce. Several of the males have a tint of black in the hind wings, one being dis-

tinctly black-shaded except along the margins of the wing. Another, from Orizaba, has the hind wings entirely black, the abdomen also black above, but the fore wings scarcely tinged by the dark color. Another, from Cuernavaca, has the hind wings still blacker, the abdomen deep black above, the fore wings brown, as described for *fuliginosa* Rothschild. A female from Merida, Venezuela, agrees closely in color with the description of *bricenoi* Rothschild, but the markings of these two forms are so incompletely described that I can not decide whether my specimens should be referred to these species or not. If it should prove to be so, the present species must be known as *Halisidota fuliginosa* Rothschild, with *bricenoi* Rothschild as a synonym and *carinator* Dyar as the name of the normal light-colored form.

HALISIDOTA SCHAUSI Rothschild.

The specimens before me from Mexico and Venezuela appear absolutely identical, so that I am inclined to consider the races *pallida* Rothschild and *meridensis* Rothschild as unnecessary and would place the names in the synonymy. The species *schausi* itself is not strongly separated from *cinctipes* Grote, yet perhaps sufficiently so. *Cinctipes* inhabits Cuba and southern Florida, while *schausi* flourishes upon the mainland from Mexico to Argentina. The following race appears not to have been characterized by Rothschild, and, though not a Mexican development, may properly be considered here.

HALISIDOTA SCHAUSI RUSCHEWEYHI, new subspecies.

Similar to *H. schausi braziliensis* Rothschild, but pale, the markings faintly traced, and not relieved from the ground color.

Cotypes.—One male, three females, No. 13682, U.S.N.M., Buenos Aires, Argentina (G. Ruscheweyh).

HALISIDOTA UNDERWOODI Rothschild.

It appears to me very doubtful whether this should rightly be considered as a distinct species and not a race of *cinctipes* Grote. However, as *cinctipes* is well isolated geographically, and as *underwoodi* has thrown off a form in Arizona, *davisii* Hy. Edwards, which is probably best considered as a species, I am inclined to let the names stand as Rothschild has placed them. *H. underwoodi* in its normal Mexican form has the markings broad and fully developed. My specimens have a tendency to melanism in the direction of *atra* Druce, though I have no dark ones before me. Rothschild defines a race from Trinidad and Guiana as smaller and paler with a larger discoidal stigma. The following form may perhaps be separated.

HALISIDOTA UNDERWOODI MODALIS, new subspecies.

Similar to *underwoodi underwoodi*, but paler, with the discoidal stigma smaller and often disconnected from the costal markings. The size is the same.

Cotypes.—Two males, three females, No. 13683, U.S.N.M., Aroa, Venezuela (Schaus collection).

The markings of the abdomen beneath are as in *interlineata* Walker, rather than as in *underwoodi*, but I place it as a race of the latter on account of the markings of the upper side, the black edges of the wing markings being small and not diffused.

HALISIDOTA UNDERWOODI INSTABILIS, new subspecies.

In this form the markings of the fore wings are curiously reduced, with a tendency toward the pattern of *davisii* Edwards. The submarginal band is nearly completely obliterated, only a costal and marginal spot being left, with sometimes one between veins 4 and 5. The black borders of the remaining markings are distinct; the mesial band traverses the wing as a narrow riband, spreading out on the inner margin in a black line nearly to base, and also generally outward to the remains of the submarginal band. Abdomen beneath with a broken lateral black line, but without ventral spots.

Cotypes.—Three males, No. 13684, U.S.N.M., Cuernavaca, Mexico, June and August, 1906 (W. Schaus). The August specimen is much lighter in color than the others and has the costal markings reduced and broken.

This may perhaps be the form referred to by Rothschild¹ as occasional Mexican examples of *Halisidota interlineata interlineata* Walker, but I can hardly think so, as the males of *interlineata* as known to me are small, with pointed wings and the black markings very heavy on the costal area.

Genus HYPOCRISIAS Hampson.**HYPOCRISIAS LISOMA, new species.**

Ground color soiled white, shaded with rather dark brown. The body parts are of a grayish cast from the sprinkling of brown on the pale ground. Fore wing soiled whitish, the brown markings much shaded and illy defined. The terminal space is dark brown, rather narrow, and just within it is a wavy band of pale conjoined spots of the ground color. There is another pale line beyond the cell but much narrower and less well defined and a still more obscure broader one across the middle of the cell. Discal mark reniform, outlined in brown, but not conspicuous; the wing is generally irrorated and

¹ Nov. Zool., vol. 6, 1909, p. 283.

shaded with brown. Hind wing soiled whitish, with a submarginal shaded brownish band. Expanse, 35 mm.

Type.—One male, No. 13845, U.S.N.M., Mexico City, Mexico, July, 1910 (R. Müller).

HYPOCRISIAS BERTHULA, new species.

Ground color of fore wing pale yellow, appearing in a large spot at basal third of costa two spots above each other at the end of the cell, a half row of small spots beyond and a complete subterminal row; besides these are a few small spots subbasally and running down from the large costal spot. The rest of the wing is shaded with dark brown, heavily so over the median space and terminally, more lightly at base and subterminally. Hind wing yellowish white, with a discal mark, a brown terminal border on apical half and a slight subterminal marking of a row of saggitate connected markings on the veins. Expanse, 38 mm.

Type.—One male, No. 13846, U.S.N.M., Tehuacan, Mexico, September, 1908 (R. Müller).

This species resembles *Hypocrisias minima* Neumoegen, but the markings of the fore wing are different, while the hind wings are not immaculate as in that form.

Genus AMMALO Walker.

AMMALO PARANOMON, new species.

Head and thorax dark brown; abdomen brown with black segmental rings, the basal hairs above long and red, obscuring the bands on the basal segments; legs brown, becoming black outwardly on tibiae and tarsi, inside of fore femora and tips of hind tibiae reddish. Fore wing roughly squamose, dark umber brown with blackish markings; these consist of a stripe along costa and inner margin, the latter interrupted by reddish hairs at base; joining these are a small subbasal band, an inner broad curved band, a broad outer band nearly touching the marginal band; a square discal patch fused to the costal stripe; a terminal row of minute umber dots at the ends of the veins. Hind wing pale red with a broad gray submarginal band, narrowly separated from the gray fringe by reddish. Expanse, 58 mm.

Type.—One male, No. 14273, U.S.N.M., Zacualpan, Mexico, June, 1911 (R. Müller).

This species would appear to be more allied to the genus *Elysius* than to the one in which I have placed it, but vein 10 is clearly stalked on both wings. Vein 8 of the hind wings is small and weak, faintly attaining the costa as is often the case in *Elysius*, but not in *Ammalo*.

EPICRISIAS, new genus.

Hind wing with vein 4 present; hind wing with veins 6 and 7 separate; fore wing with vein 11 from the cell; vein 10 from the cell; palpi porrect; hind wing with veins 3, 4, 5 separate; hind tibiæ with two pairs of spurs; fore tibiæ unarmed; vein 3 from near angle of cell; fore wing broad; proboscis fully developed; palpi with the third joint long, spatulate, smoothly scaled.

Genotype.—*Epicrisias eschara*, new species.

EPICRISIAS ESCHARA, new species.

Reddish orange; body orange, vertex of head and tegulæ ocherous, the following parts black: palpi, front, sides of thorax, legs, except fore coxæ, a lateral stripe on the abdomen, the pair becoming conjoined posteriorly and covering the venter of the last segment and half of the penultimate one; antennæ black, shorty pectinated in the female. Fore wing rosy orange, shading to orange along the costa and outer margin, the vestiture transversely squamose basally. Hind wing rosy, semitranslucent centrally, orange tinted along costa and margin. Expanse, 54 mm.

Type.—One female, No. 13847, U.S.N.M., Zacualpan, Mexico, June, 1910 (R. Müller).

Genus CALIDOTA Dyar.

CALIDOTA MOMIS, new species.

Body and legs gray, vertex of head and collar dull ocher, the latter with two large black points; abdomen ocherous above, with a row of dorsal black spots, well separated. Fore wing gray with three black points, one in the cell, two beyond, above the bases of veins 4 and 5, respectively; hind wing semihyaline whitish, the veins dark, the margin broadly gray shaded. Expanse, 50 mm.

Cotypes.—Male, No. 13848, U.S.N.M., Jalapa, Mexico (Schaus collection); female, Misantla, Mexico, June, 1910 (R. Müller).

Allied to *C. gemma* Schaus from Venezuela.

CALIDOTA ALBATICOSTA, new species.

Head gray, crimson behind; thorax dark gray dorsally with a white line along anterior edge of collar, tinged with crimson beneath; abdomen crimson above with a dorsal series of small dark points; venter whitish with a lateral row of dark spots, the last two segments dark beneath. Fore wing dark gray, the costa broad white almost to apex. Hind wing white, the veins dark. Expanse, 37 mm.

Type.—One male, No. 13849, U.S.N.M., Tehuacan, Mexico, September, 1910 (R. Müller).

This species in its wing shape and coloration resembles species of the genus *Euchætias*, and is unlike most of the *Calidota*.

Genus *EUCHÆTIAS* Lyman.*EUCHÆTIAS PARAZONA*, new species.

Dark, blackish gray; back of head with two orange points and an orange stripe running to the base of the wing; fore coxæ crimson; abdomen red above with segmental black bands, the anal tuft white, gray below. Fore wing blackish gray, the costa orange yellow nearly to apex; fringes of both wings whitish. Expanse, 48 mm.

Type.—One female, No. 14214, U.S.N.M., Misantla, Mexico, July, 1911 (R. Müller).

Genus *HYPHANTRIA* Harris.*HYPHANTRIA PENTHETRIA*, new species.

Head and collar white, the palpal hairs, a spot on front and two on collar dark gray. Thorax yellowish white, the patagia striped with gray inwardly. Legs white, ringed with black, the fore femora and tibiæ marked with orange. Abdomen orange above, white beneath, with a dorsal series of transverse black marks, a lateral and small sublateral row of spots. Fore wing blackish gray, the veins lined with white except the discal cross-vein; the subcostal white streak above the cell is very broad as also on the basal half of vein 1, and there is a broad streak on the submedian fold, not reaching base or margin; fringe white except in a patch at vein 3. Hind wing blackish with a white ray on submedian fold, the fringe white except at the end of vein 3. Expanse, 34 mm.

Type.—One male, No. 13850, U.S.N.M., Tehuacan, Mexico, August, 1910 (R. Müller).

Genus *ECPANTHERIA* Hübner.*ECPANTHERIA EURIPIDES*, new species.

Head blue-black in front, yellowish white on vortex; tegulæ broadly blue-black with narrow orange edges; thorax greenish black, the patagia with orange edges. Abdomen orange with two dorsal rows of small black spots, a lateral row, the venter banded with black, the last segment wholly black. Fore wing cream color, crossed by rows of large angular deep black spots; a minute one at base; first row of two and a line below vein 1; second row of three narrow spots; third row of five large spots, either square or triangular; a double lunate bar at end of cell; fourth row of seven narrow spots; fifth row of four spots above end of median vein; sixth row marginal of four small spots above, each divided by pale veins, a streak above vein 4, a large spot between 3 and 4, two between veins 2 and 3, obliquely divided, a large one between 1 and 2, obliquely divided by a narrow line, and small one on inner margin; the larger cross-lines of the

cream colored ground have centering orange streaks. Hind wing pointed at tornus, orange yellow, with gray spot at end of cell and four small ones in a square near apex. Legs entirely black. Expanse, 50 mm.

Type.—One male, No. 13851, U.S.N.M., Mexico (Ritchie, through J. Doll).

Allied to *E. cotyora* Druce, the markings blacker, more angular and differently arranged, the hind wings yellow and more pointed at tornus.

Family NOCTUIDÆ.

Subfamily AGROTINÆ.

Genus POROSAGROTIS Smith.

POROSAGROTIS CAMALPA, new species.

Fore wing purplish gray; basal space broadly lighter gray; inner line pale, straight, of three shallow arcs, bordered with blackish, most strongly so without; claviform a pale dash, indistinctly darker outlined; reniform large, round, a little pear-shaped, gray; reniform also pale but with darker center; cell dark, but hardly filled with a different color; outer line pale, slender, excurved over cell, with a slightly darker inner edge; subterminal line irregularly waved, preceded by a dark shade; fringe pale. Hind wing cinereous with pale fringe. Expanse, 31 mm.

Type.—Female, No. 13921, U.S.N.M., Mexico City, Mexico, August, 1910 (R. Müller).

Genus EPISILIA Hübner.

EPISILIA CYMINOPRISTES, new species.

Thorax and fore wings brownish gray, uniform, shining; a small dark dash in place of orbicular and a small spot for reniform; outer line a row of small dark dots, evenly curved, inconspicuous; terminal dots more distinct than these and more separated. Hind wing whitish with gray terminal line; veins darkened especially above cell. Expanse, 53 mm.

Type.—Female, No. 13922, U.S.N.M., Mexico City, Mexico, August, 1910 (R. Müller).

Genus LYCOPHOTIA Hübner.

LYCOPHOTIA PAMPOLYCALA, new species.

Violaceous gray; fore wing with a broad ochraceous subcostal stripe, reaching to the reniform, with three light costal spots above it, equally spaced; reniform large, semilunate, pale ocherous, with a curved central brown line; orbicular pale, black ringed; a black inner

margin to the reniform; a black broken line in submedian fold at base, followed by the black claviform; lines pale, rather broad and illy defined, their dark edges indistinct, the inner slightly wavy, the outer excurved over cell; subterminal line pale, incurved at submedian and discal areas; terminal space larger, with terminal row of black dots. Hind wing white, subpellucid, with a dark terminal line. Expanse, 33 mm.

The female before me is similar, but the black shadings more distinct. The cell is filled in with black between the stigmata and there is a little black beyond the reniform; the basal mark is broad and continuously black, the claviform is fuller, while the terminal space has the veins black-lined. Hind wing with gray shading at the apex. Expanse, 35 mm.

Cotypes.—No. 14210, U.S.N.M., male, Cuernavaca, Mexico, May, 1911 (R. Müller); female, Guerrero, Mexico (J. Doll).

LYCOPHOTIA RICHIOIDES, new species.

Pale clayey ocherous; fore wing powdered with gray-brown, leaving the lines of the ground color; a black dot near the base; inner line straight, oblique, edged with blackish outwardly on outer half below; orbicular and reniform large pale rings with dark powdering between; outer line evenly curved over cell; submarginal line slightly waved. Hind wing with the veins soiled and dark discal spot. Expanse, 43 mm.

Type.—Female, No. 14211, U.S.N.M., Cuernavaca, Mexico, May, 1911 (R. Müller).

LYCOPHOTIA TRIPHENOIDES, new species.

Fore wing reddish ocherous, the terminal space clayey ocher; reniform large, solidly black; outer line far out, curved, pale, with slight dusky edging; subterminal line a row of dots, slightly waved; a row of minute terminal dots. Hind wing blackish, the fringe pale, with dark discal mark. Below all pale, with dark discal marks and outer line on both wings. Expanse, 41 mm.

Type.—Female, No. 14212, U.S.N.M., Mexico City, Mexico, May, 1911 (R. Müller).

Subfamily HADENINÆ.

Genus POLIA Ochsenheimer.

POLIA TRASCA, new species.

Rather dark gray; basal space narrowly gray, with a pale subbasal line picked out by black spots; subbasal space broadly submetallic olivaceous; inner line black, oblique, nearly straight; mesial space dark gray, the orbicular and reniform paler, faintly dark-outlined; outer line black, oblique, reversed in direction to the inner

line, the pair approaching on inner margin, excurved over cell; subterminal line whitish, wavy, indistinct; a black dash above tornus, with whitish dash below it. Hind wing whitish, gray-shaded at apex and narrowly on outer margin. Expanse, 23 mm.

Type.—Male, No. 13923, U.S.N.M., Tehuacan, Mexico, August, 1910 (R. Müller).

POLIA CLEPTOSCHEMA, new species.

Fore wing gray, rather irregularly mottled; a white dash at the base, divided and bordered below by black scales; inner line of three whitish segments, not well connected nor distinctly bordered; clavi-form outlined in black, broad; orbicular a minute black circle; reniform black-outlined, with a white line on the outer side of the center; outer line black, single, excurved over cell, dentate on the veins, strongly so on vein 1 with a white cusp in submedian interspace; subterminal line black, forming a dash on costa, a longitudinal dash above tornus with white speck below it; fringe pale with central wavy black line and two rows of dots. Hind wing whitish, stained with gray at apex and narrowly on outer margin. Expanse, 27 mm.

Type.—Male, No. 13924, U.S.N.M., Tehuacan, Mexico, August, 1910 (R. Müller).

Genus HYSSIA Guenée.

HYSSIA NEPHROSTICTA, new species.

Brown-gray; lines black, geminate, the filling somewhat paler than the ground; subbasal dentate; inner crenulate; a black arc for clavi-form; orbicular a black ring; reniform filled in with white, somewhat broken and spotted; outer line excurved over cell; terminal space darkly shaded, through which runs the black subterminal line irregularly waved. Hind wing shaded with brownish gray, the fringe pale. Expanse, 20 mm.

Type.—Female, No. 13925, U.S.N.M., Tehuacan, Mexico, September, 1910 (R. Müller).

This species was determined as new by Sir G. F. Hampson.

Genus CHABUATA Walker.

CHABUATA RECTINUBILA, new species.

Fore wing powdery brownish gray, the lines obliterate; a subterminal oblique straight pale shade from near apex to outer fourth of inner margin; a straight mesial dark shade; lines in part faintly traceable, the reniform the most distinct, large, dark-filled; a pale terminal line; fringe the color of wing. Hind wing gray, whitish over the disk. Expanse, 33 mm.

Type.—Female, No. 11318, U.S.N.M., Orizaba, Mexico (Schaus collection).

CHABUATA GRISEAGO, new species.

Fore wing light powdery gray, the markings obliterate; a diffused whitish shade from apex to outer fourth of inner margin, followed by a dark shade, the terminal part of the wing beyond this line darker than the rest; the whitish line is obscurely geminate; a slight discoloration at the end of the cell. Hind wing gray, a little lighter in the cell; fringe pale. Expanse, 28 mm.

Type.—Male, No. 13926, U.S.N.M., Mexico City, Mexico, July, 1910 (R. Müller).

Genus *ERIOPYGA* Guenée.*ERIOPYGA CYMAX*, new species.

Light red-brown; lines faint, geminate, dark red, the filling slightly pale; reniform ocher with two black points, the upper concrete, the lower diffused; subterminal line pale, wavy, faint like the fillings of the other lines. Hind wing blackish gray, the fringe pale red. Expanse, 33 mm.

Type.—Male, No. 13927, U.S.N.M., Misantla, Mexico, June, 1910 (R. Müller).

The species has broad, rather square wings.

ERIOPYGA MELANOPS, new species.

Dark gray; orbicular and reniform solidly black-filled; lines inconspicuous, the subbasal picked out in black; inner line double, with a black mark at claviform; outer line indistinctly doubled, the outer segment dentate, forming small streaks; terminal area darker, the subterminal line pale, narrow, scarcely waved, yet not rigid; a pale line at base of fringe. Hind wing gray, lighter on basal two-thirds. Expanse, 28 mm.

Type.—Male, No. 13928, U.S.N.M., Zacualpan, Mexico, August, 1909 (R. Müller).

Subfamily CUCULLIINÆ.

Genus *PSEUDANARTA* Grote.*PSEUDANARTA HETEROCHROA*, new species.

Lightest part of ground pale ochery, largely overwashed with olivaceous; basal space narrowly olivaceous; subbasal space shaded with brown; inner line whitish, oblique, incurved below vein 1; brown marks for orbicular and reniform; veins pale over discal area, forming distinct points on veins 3 and 4; outer line whitish, curved, faint, followed above by a triangular dark cloud on costa; a subterminal black shade, from apex to outer third of inner margin, relieving the dentations on veins 3-4; a terminal row of dashes; fringe brown. Hind wing with the basal half dark yellow, the outer half black; fringe white. Expanse, 26 mm.

Type—Male, No. 13929, U.S.N.M., without definite locality (R. Müller, No. 1379).

This species was identified by Sir G. F. Hampson.

Subfamily ACRONYCTINÆ.

CENTROCHLORA, new genus.

Fore wing with areole; fore tibia with claw on inner side only; front without prominence; proboscis fully developed; thorax roughly clothed with hair and scales; palpi short, porrect, not exceeding the front; fore tibia short, not twice as long as its claw.

Genotype.—*Centrochlora esmeralda*, new species.

Examined by Sir G. F. Hampson, who labeled it "Gen. nov. near *Agriopodes*, in key near *Centrartha*." He also suggested the names here used.

CENTROCHLORA ESMERALDA, new species.

Dark green, collar with white points behind, patagia with white lines and two points on posterior side of disk. Fore wing green (faded to yellowish in the specimen); a white point at base; orbicular, reniform and claviform large white spots; a broad white subterminal band; black markings a triangular patch at base, nine dots on costa, inner line below median vein, excurved between the veins, outer and inner edges of discal spots, twin bars between claviform and outer line, subterminal line broken, powdery, sharply pointed inward on submedian, and a row of spots in the fringe. Hind wing whitish, possibly originally stained with green outwardly. Expanse, 29 mm.

Type—Male, No. 13930, U.S.N.M., Mexico City, Mexico, July, 1909 (R. Müller).

Genus SIMYRA Ochsenheimer.

SIMYRA UNIFACTA, new species.

Pale straw color; fore wing evenly and finely irrorated with brown, forming slight longitudinal streaks along the center of the wing and leaving the veins a little paler; no markings. Hind wing creamy white. Expanse, 38 mm.

Type—Male, No. 13931, U.S.N.M., Misantla, Mexico, June, 1906 (R. Müller).

Genus PERIGEA Guenée.

PERIGEA MENOTA, new species.

Dark gray, mottled, strigose, the ordinary lines and spots not well relieved; reniform and orbicular large, concentric-ringed; edge of the reniform picked out in white; outer line smooth, gently excurved in the middle; subterminal line the edge of a dark shade, relieved by whitish beyond; termen again dark. Hind wing grayish, darker on the veins, a submarginal indistinct paler area. Beneath powdered with gray; termen of fore wing sharply pale; hind wing with a black

discal point, a mesial narrow line, and a subterminal shaded broad one. Expanse, 28 mm.

Type—Female, No. 14216, U.S.N.M., Tehuacan, Mexico, September, 1908.

The specimen was determined by Sir G. F. Hampson, as *Perigea concisa* Walker. It is extremely close to that species in markings, but the form is much slenderer than any *concisa* in my series, while the hind wings beneath differ considerably.

PERIGEIA MICRIPPIA, new species.

Head and collar reddish brown; disk of thorax silvery gray; abdomen pale gray. Fore wing silvery gray marked with reddish brown; the brown color along the costa forms a patch at basal fourth, a long one near the middle extending down between the large concolorous stigmata, a small patch above reniform and three dots beyond; a brown patch in base of cell before orbicular; a small quadrate patch below orbicular; outer line double, indistinct; a brown dash from apex to outer line, the subterminal space below it solidly filled with brown, the terminal space less brown but likewise solidly filled, the colors separated by a wavy luteous subterminal line; a dark dot above tornus; a row of fine terminal black dashes; reniform and orbicular defined from the ground color by the brown shadings and a median longitudinal grayish shade and also a few black specks on their margins. Hind wing soiled whitish, stained with brown on the termen, especially broadly so at apex. Beneath the costal region of fore wing and apex of hind wing is irregularly blotched with dark red. Expanse, 25 mm.

Type.—Male, No. 14238, U.S.N.M., Misantla, Mexico, January, 1911 (R. Müller).

Genus APATELA Hübner.

APATELA RAPIDAN, new species.

Uniform cinereous; fore wing with the inner line black, double, dentate; a black basal longitudinal line on submedian fold to end of inner line, with some black shading below it; orbicular round, black outlined, paler than the ground color; a dark line on costa; reniform dark, concolorous, with a black curved line for its inner border; outer line single but with a whitish inner edge, starting on costa above reniform, curving broadly outward, retracted below vein 4, finely crenulate-dentate on the veins; a black streak crossing this line in submedian fold to termen; a row of terminal black dots in the fringe, becoming short dashes below. Hind wing pale grayish with a small dark discal dot and shaded outer line, the termen darkly shaded. Expanse, 32 mm.

Type.—Female, No. 14240, U.S.N.M., Misantla, Mexico, May, 1911 (R. Müller).

Genus OXYCNEMIS Grote.

OXYCNEMIS MEXICANA, new species.

Cinereous, faintly lilacine tinted; subbasal line black, angled; inner line black, curved, the space between a little lighter than the ground color; an irregular dusky mesial line, from costa at outer line, bent along median vein, then angled and running obliquely outward to middle of inner margin; a small dark mark in cell; outer line blackish, irregularly waved and crenulate, followed by a dark triangular shade at apex and then a pale area; terminal space again cinereous. Hind wing dark gray. Expanse, 22 mm.

Type.—Female, No. 13934, U.S.N.M., Cuernavaca, Mexico, July, 1909 (R. Müller).

Determined by Sir G. F. Hampson. The claw on fore tibia is minute.

Genus LAPHYGMA Guenée.

LAPHYGMA NIGRESCENS, new species.

Thorax black; fore wing grayish clay color, shaded with black; basal space to inner line filled with black irrorations; upper half of median space confused with dark shadings, the dark mesial shade running through it; claviform outlined; orbicular and reniform pale, without distinct outlines and with black centers, that of the reniform in its lower half; a square black subapical patch; subterminal line blackish, waved; ordinary lines lost. Hind wing pure white, with fine gray line before the fringe. Expanse, 26 mm.

Type.—Male, No. 13935, U.S.N.M., Tehuacan, Mexico, August, 1910 (R. Müller).

Determined by Sir G. F. Hampson.

Genus MONODES Guenée.

MONODES NIVEOPIS, new species.

Dark ocher-brown; inner line geminate, crenulate, blackish, clouded; claviform outlined, clouded; orbicular a bright white speck; median shade-line dark, inflexed on subcosta and median; reniform black-filled, nearly divided into two round spots; outer line dark, single, strongly incurved on subcosta, followed below by a row of dots; terminal space blackish shaded, through which runs the pale wavy subterminal line. Hind wing brown-black with a darker discal mark. Expanse, 29 mm.

Cotypes.—Two females, No. 13936, U.S.N.M., Misantla, Mexico, May and December, 1910 (R. Müller).

Determined by Sir G. F. Hampson.

MONODES CASSIDA, new species.

Fore wing warm brown; basal space blackish shaded; inner line whitish, slender, nearly straight, followed by a narrow dark line; orbicular a black point; reniform a small black elliptical spot; mesial shade line dark, angled outward in cell to reniform and again outward on submedian fold; outer line curved, pale, preceded by a row of black dots, followed by a blackish shading that fills all of terminal space; subterminal line pale, faintly indicated; a row of pale specks at base of fringe. Hind wing shaded with gray, with some reddish at anal angle; a small dark discal dot; outer line pale, faint, showing only at inner margin; a row of pale specks in fringe. Expanse, 20 mm.

Cotypes.—Three females, No. 13937, U.S.N.M., Coatepec, Mexico, October, 1910; Orizaba, Mexico, November, 1910; Misantla, Mexico, January, 1911 (R. Müller).

Sir G. F. Hampson kindly examined this with the others and labeled it "*Monodes*, not good enough to describe." The specimen, however, appears to me to be in good condition except that the apex of one wing is torn off. I have also received two others in good condition. The species is perhaps the same as *Micromonodes mochensis* Schaus.

Genus AMIANA Dyar.

AMIANA ENDOPOLIA, new species.

Light umber brown, washed with darker shades; inner line geminate, its outer segment black, the inner scarcely defined, the space between more or less completely filled by white powdering; the line is retracted a little in cell and distinctly so on submedian; lower part of median space filled solidly with white scaling or powdered with white, this area obliquely limited above, on the inner side reaching up to the cell; median shade-line shown as a zigzag of the dark ground through the white area; orbicular and reniform powdery white-filled, black-edged but not contrastingly so, irregularly black-centered; outer line black, single, strongly dentate on the veins, the dentations with minute capitate tips, the line cutting the extreme edge of the white patch on inner margin; subterminal line blackish, waved, with an elongate dark cloud opposite lower edge of reniform and one on margin above tornus; fringe shaded with black with a row of pale specks at base. Hind wing grayish brown, with discal mark and double outer dark bands, shaded and obscure. Expanse, 37 mm.

Cotypes.—Two females, No. 13938, U.S.N.M., Tehuacan, Mexico, September, 1908, September, 1910 (R. Müller).

The whitest specimen was examined by Sir G. F. Hampson and the name here used was suggested by him.

Genus *ACHATODES* Guenée.*ACHATODES METALEUCA*, new species.

Fore wing very light reddish brown, the markings obliterate; orbicular and reniform large, rounded, paler; a whitish space at apex, sharply obliquely limited inwardly, from which a brown submarginal line parallel to outer margin is faintly traceable. Thorax whitish. Hind wing white, thin and silky. Expanse, 32 mm.

Type.—Male, No. 13891, U.S.N.M., Tehuacan, Mexico, June, 1910 (R. Müller).

Determined, and the name suggested by Sir G. F. Hampson.

Genus *ERYTHRÆCIA* Hampson.*ERYTHRÆCIA EUPOSIS*, new species.

Thorax and fore wing yellow, much spotted with rose-pink. A row of spots along costa; two in base of cell; orbicular and reniform large, touching subcostal vein; two large spots below orbicular in a line to inner margin; a row of minute ones mesially; an outer band of spots of three rows close together and partly confluent; a neat terminal row of round spots between the veins; a row of confluent spots in the fringe. Hind wing black, the fringe white. Abdomen black, the tips of the segments pale, whitish beneath. Expanse, 36 mm.

Type.—Male, No. 13892, U.S.N.M., Tehuacan, Mexico, September, 1910 (R. Müller).

Genus *PAPAIPEMA* Smith.*PAPAIPEMA APICATA*, new species.

Dark brown, bases of antennæ and patagia with white spots; fore wing dark brown, nearly solidly so on lower half to tornus; base white, crossed by a fine brown line; a white speck in base of cell; claviform a large white elliptical spot with a white dot just above its upper edge and a fine line running across cell; seven white spots on costa; orbicular round, white, with a brown central dot; reniform with yellow center and fine brown line, two white spots before it and four on the outer border; a white elliptical spot at apex, cut by two brown veins and showing faint spottings submarginally below; a dark line at base of fringe. Hind wing cinereous shaded, the veins darker; fringe pale. Expanse, 30 mm.

Type.—Female, No. 13893, U.S.N.M., Zacualpan, Mexico, September, 1909 (R. Müller).

Examined by Sir G. F. Hampson, and the name suggested by him.

Genus OGDOCONTA Butler.

OGDOCONTA PLUMBREA, new species.

Dark purplish brown; fore wing dark brown to beyond cell; following area lighter with a leaden purple shade, the margin again dark; lines faintly indicated by lighter scales, scarcely traceable except the subterminal which is twice waved. Hind wing dark gray, a little lighter at base, a black line on termen, followed by white in base of fringe. Expanse, 29 mm.

Cotypes.—Male, No. 13894, U.S.N.M., Orizaba, Mexico, September, 1909 (R. Müller); female, Misantla, Mexico, July, 1910 (R. Müller).

This species was examined by Sir G. F. Hampson and determined as new.

PERICONTA, new genus.

Fore wing with an areole; tibiae of fore legs short and stout, unarmed, the tarsi very short with large claws; front with conical process with vertical ridge; abdomen without crests.

Genotype.—*Periconta obliqua*, new species.

PERICONTA OBLIQUA, new species.

Dark purplish brown to the outer line; subbasal and inner lines slender, pale, faint; a black spot on inner margin between; orbicular and reniform faintly shown in pale; outer line an obliterate slender whitish line preceded by intensification of the dark shading; a subterminal broad shaded very dark band, obsoletely cut by the veins; a pale line at base of fringe. Hind wing very dark gray with pale line at base of fringe. Expanse, 27 mm.

Type.—Male, No. 13895, U.S.N.M., Tehuacan, Mexico, September, 1910 (R. Müller).

The genus and species were determined by Sir G. F. Hampson and the names kindly suggested by him.

Genus SATRAPODES Hampson.

SATRAPODES DOSCA, new species.

Thorax and fore wing bronzy yellowish; a brown bronzy shading from base along costa to below cell, narrowing at middle line, then filling the whole terminal area to a point at apex; three slender brown lines, the inner curved in an arc, the middle one bent at a sharp angle beyond cell, the outer at a still sharper angle, running from costa almost to outer margin, then straight to inner margin at its outer third; reniform a blackish cloud with a bright white spot below it; a white speck in cell; subterminal line nearly parallel to the outer margin, dark, wavy, rather broad, contained in the terminal dark shading. Hind wing dark brown, the fringe paler. Expanse, 30 mm.

Type.—Female, No. 13896, U.S.N.M., Zacualpan, Mexico, September, 1910 (R. Müller).

BISTICA, new genus.

Fore wing with an areole; fore legs unarmed; front with a truncate conical prominence with raised edges; and central point; eyes large; tongue distinct; abdomen with dorsal crest at base only; prothorax without crest; fore wing excavate on the outer margin below apex.

Genotype.—*Bistica noela*, new species.

BISTICA NOELA, new species.

Ocherous yellow; basal area of fore wing bronzy golden, limited outwardly by a brown line, which is incised on vein 1, nearly dividing the patch into two, one at base, one on inner margin; a similar golden area following the lower half of the outer line; a faint broad extra-mesial dark shade crossing the wing, its edges irregular; a dark speck in cell; reniform undifferentiated; outer line slender, strongly ex-curved over cell; submarginal line midway between it and the margin, less distinct and more flexuous; a narrow brown terminal line. Hind wing shining gray. Expanse, 22 mm.

Type.—Female, No. 13897, U.S.N.M., Tehuacan, Mexico, September, 1910 (R. Müller).

This is probably *Mychonia* (?) *noela* Druce, figured in the *Biologia Centrali-Americana*, pl. 47, fig. 28, and I have accordingly used the same specific name.

Genus ANTAPLAGA Grote.**ANTAPLAGA STIGMATOSA, new species.**

Thorax orange; fore wing golden yellow with black lines; inner line straight oblique, geminate, filled with powdery black; cell so filled; a black dash for claviform; orbicular large, round, white; reniform similar but less clear white and constricted; middle line single, dentate on the veins, separated from the dark cell only below median vein; outer line geminate, powdery-filled, dentate on the veins and also incurved opposite cell and on submedian; a terminal row of small black dots connected with larger spots in the fringe; hind wing brownish black, the fringe golden yellow with black spottings at base. Expanse, 27 mm.

Type.—Female, No. 13898, U.S.N.M., Mexico City, Mexico, September, 1906 (R. Müller).

ANTAPLAGA HEMICROCEA, new species.

Thorax orange; fore wing golden yellow without markings; orbicular shown very faintly as a large paler area, and there are faint outlines of markings in dark orange, apparently as in the preceding. Hind wing and abdomen black, the wing with golden yellow fringe. Expanse, 25 mm.

Type.—Male, No. 13899, U.S.N.M., Zacualpan, Mexico, September, 1910 (R. Müller).

This may be a form of the preceding, with the markings obliterated. The undersides are alike in both, black with orange fringes and a yellowish spot in the cell of fore wing.

ANTAPLAGA PLESIOLAUCA, new species.

Head, thorax and extreme base of fore wing golden yellow; rest of fore wing leaden brown with violet and blue reflections; basal third and three streaks in the outer field dark metallic purplish. Hind wing dull black, the fringes of both wings gray. Beneath gray, shading to yellowish toward base of costa and inner margin of fore wing and over basal half of hind wing. Expanse, 31 mm.

Type.—Female, No. 13900, U.S.N.M., Sierra de Guerrero, Mexico, October, 1910 (R. Müller).

ANTAPLAGA MELANOCRYPTA, new species.

Vertex and thorax white; beneath, with legs and abdomen black; fore wing pure white; three little black dots at basal third, one on costa, one submedian, one on inner margin; two outwardly, one on inner margin, one on submedian. Hind wing black with white fringe. Beneath black; fringes of both wings narrowly white. Expanse, 27 mm.

Type.—Female, No. 13901, U.S.N.M., Tehuacan, Mexico, June, 1910 (R. Müller).

Determined by Mr. Schaus as close to *Antaplagia pyronæa* Druce.

Genus STIBADIUM Grote.

STIBADIUM RAGLENA, new species.

Lustrous brown with a purplish tinge; inner line whitish, bent at right angles at median; reniform and orbicular large, whitish-ringed, filled with the shade of the darkest part of the ground color; outer line whitish, oblique, bent opposite the cell and reflexed to costa; terminal space lighter, the subterminal line whitish, twice waved, preceded by a dark shade which is indistinctly broken into rounded spots; a whitish shade at the pointed apex; fringe dark with a white line at its base. Abdomen and hind wing whitish with a little brown shading, spread uniformly over the wing and relieving a faint pale mesial line. Expanse, 37 mm.

Type.—Female, No. 13932, U.S.N.M., Guerrero, Mexico (J. Doll collection).

Genus EMARGINEA Guenée.

EMARGINEA NOCEA, new species.

Front and patagia white; collar black; fore wing creamy white, shaded with pale brown (probably originally olive green); basal space

a pale creamy, lighter outwardly, terminating in an arc; upper half of median space velvety black except for a costal cream-colored space with curved lower edge that rests on the inner line and occupies two-thirds of the costal distance of median space; outer line double, black, finely wavy; a row of black specks along the costal edge and in the fringe; terminal space mottled with pale brown (olive green?). Hind wing whitish, thin, a little shaded with gray, showing a faint discal dot and an outer wavy gray line, broken in the middle. Expanse, 25 mm.

Type.—Female, No. 13933, U.S.N.M., Orizaba, Mexico, February, 1909 (R. Müller).

The specimen was kindly examined by Mr. W. Schaus, who labeled it "*Emarginea*, not in British Museum."

Genus CHALCOPASTA Hampson.

CHALCOPASTA RIANDANA, new species.

Thorax and fore wing ochreous irrorated with brown, the fore wing with large greenish bronzy patches; a triangular one at base, touching on median vein a spot that fills cell to end, crosses it to inner margin at middle of wing and fills in all the terminal area but the fringe, leaving a patch of the ground color on costa and covering the position of the reniform. Hind wing whitish, stained with gray in a submarginal band toward apex. Expanse, 33 mm.

Type.—Male, No. 13902, U.S.N.M., Tehuacan, Mexico, September, 1908 (R. Müller).

CHALCOPASTA DYENOA, new species.

Uniform bronzy brown; on fore wing the inner line is traceable as a darker line, bent at an angle on submedian; outer line similar, excurved over cell; a dark mark for reniform; outer margin a little excavate below apex. Hind wing dark brown, the fringe paler at tip. Expanse, 32 mm.

Type.—Male, No. 13903, U.S.N.M., Tehuacan, Mexico, September, 1910 (R. Müller).

A female specimen from the same locality has a bright white spot in the cell and another larger one on the lower half of the reniform.

Genus CIRRHOPHANUS Grote.

CIRRHOPHANUS MIAIPHONA, new species.

Thorax and fore wing orange yellow, the veins and folds lined with dark brown except just at the margin where the linings fade out; inner line slender, red, straight, bent at right angles on median vein; a straight brownish red shade-band across middle of wing, touching the apex of the inner line; marking on the discal cross-vein a little heavier than the other linings; a faint oblique line beyond from costa

to vein 7; no subterminal markings. Hind wing pale orange yellow, the veins a little darker. Expanse, 33 mm.

Type.—Female, No. 13904, U.S.N.M., Guadalajara, Mexico (Schaus collection).

This species and *Cirrhophanus papago* Barnes, form a distinct section of the genus, perhaps worthy of separation.

Genus STIRIA Grote.

STIRIA ISCHUNE, new species.

Thorax gray-purple, vertex and collar stained with yellow. Fore wing golden yellow, marked with purple-gray; a small patch at base on inner margin; a large patch at the middle of the margin from which a waved outer line nearly attains costa; two discal dots and one in the cell; a gray patch on outer margin, widest in the middle, covering the fringe. Hind wing and abdomen dark gray, the fringe paler. Expanse, 37 mm.

Type.—Male, No. 13905, U.S.N.M., Tehuacan, Mexico, September, 1910 (R. Müller).

Allied to *Stiria rugifrons* Grote, but with larger markings and dark hind wings.

STIRIA SISAYA, new species.

Vertex and collar yellow, thorax gray. Fore wing sulphur yellow; a small gray-brown patch on inner margin near base with a dot above it in cell; a small angular patch on middle of margin with a point inward on vein 1; four dots at end of cell; outer line fine, brown, wavy, and broken, incurved above vein 2; outer margin dark, with a widening above middle and near tornus. Hind wing pale gray, with whitish fringe. Expanse, 33 mm.

Type.—Male, No. 13906, U.S.N.M., Tehuacan, Mexico, September, 1908 (R. Müller).

Allied to *Stiria sulphurea* Neumoegen.

STIRIA MOURIS, new species.

Vertex yellow, thorax dark gray, abdomen pale clay-color. Fore wing pale sulphur yellow; a gray patch at base on inner margin; a larger one at middle; outer line slender, wavy, running into this patch; orbicular a dark ringlet in cell; reniform of two dots and oblique costal shade; a large gray patch on outer margin, triangularly widening in the middle to touch the outer line; fringe dark. Hind wing white, a little soiled with gray along the outer margin. Beneath whitish, the apical half of fore wing overspread with gray. Expanse, 30 mm.

Type.—Male, No. 13907, U.S.N.M., Tehuacan, Mexico, September 1910 (R. Müller).

Genus STIRIODES Hampson.

STIRIODES CONDISTICA, new species.

Thorax and fore wing sulphur yellow; three brown costal spots and one on center of inner margin; a dot in center of cell and one below vein 2; a faint line from the spot on inner margin followed by the two other similar lines and a row of faint dots, the latter submarginal; margin with a shallow subapical excavation. Hind wing straw yellow, brighter outwardly, the veins darker-marked; a mark on discal cross-vein; a narrow mesial brown line and a broader submarginal one. Expanse, 30 mm.

Type.—Female, No. 13908, U.S.N.M., Cuernavaca, Mexico, July, 1906 (W. Schaus).

STIRIODES NEPOTICA, new species.

A small species with the outer margin entire. Fore wing brownish ocher, shaded with dark brown except in a mesial band and on termen; two brown costal patches. Lines indistinct, showing faintly as rows of dots. Hind wing blackish with yellow fringe. Expanse, 16 mm.

Type.—Male, No. 13909, U.S.N.M., Salina Cruz, State of Oaxaca, Mexico, September, 1906 (W. Schaus).

CIRRODISTIS, new genus.

Fore wing with an areole; legs unarmed; frons with prominence with shovel-shaped process at middle; proboscis present; eyes large; thorax clothed with hair-like scales; plate below the frontal prominence short with pointed corners; fore wing with the outer margin doubly excavated; hind wing slightly excavated below apex.

Genotype.—*Cirrodistis benedicta*, new species.

CIRRODISTIS BENEDICTA, new species.

Thorax and base of fore wing bronzy brown, the color sharply limited by a darker line; rest of fore wing yellow; a faint mesial narrow line, broken across cell; outer line near the margin, narrow, brown, faintly duplicated; a brown line at base of fringe. Hind wing yellowish with a mesial line followed by dark shading half way to the margin with dentate edge; a brown line at base of fringe. Expanse, 30 mm.

Type.—Female, No. 13910, U.S.N.M., Zacualpan, Mexico, September, 1910 (R. Müller).

LETABA, new genus.

Fore wing with an areole; fore legs without spines; frons with a truncate conical prominence; thorax and abdomen without crests; eyes large, round; frontal prominence short, with flat tip, the edges

scarcely raised; palpi oblique, thickened with scales, the end joint short.

Genotype.—*Letaba noa*, new species.

LETABA NOA, new species.

Black, the fringe of both wings white. Beneath, the tongue, basal joint of palpi, base of fore wing running along costa and basal half of costa of hind wing bright orange yellow; fringe as above. Expanse, 43 mm.

Type.—Female, No. 13911, U.S.N.M., Zacualpan, Mexico, September, 1909 (R. Müller).

Mr. Schaus kindly compared this species in London and labeled it "Arctiid, quite new;" but it seems to me to be rather a noctuid, as vein 8 of the hind wings makes only a short anastomosis with the cell.

Genus GERRA Walker.

GERRA SOPHOCLES, new species.

Fore wing brown with a white oblique costal shade before apex; reniform and orbicular lighter brown; inner and outer lines very faint, dark; a light reddish submarginal row of joined spots bordered within with red-brown. Hind wing and abdomen dull gray-black, the fringe white. Beneath shining leaden black, the veins black; fringe of fore wing partly white; bases of both wings, tongue and base of palpi bright orange yellow. Expanse, 34 mm.

Type.—Male, No. 13912, U.S.N.M., Cuernavaca, Mexico, July, 1906 (W. Schaus).

Genus GERRODES Hampson.

GERRODES MINATEA, new species.

Thorax and fore wing leaden gray, with brown streaks; an oblique whitish shading from before apex into cell, crossed by the brown streaks; a brown outer line parallel to outer margin above curves in below cell and joins the other streaks; closely following it a fine white line also curves inward and becomes a broad white band below cell, not reaching base; a slender whitish line beyond in the gray terminal space; a leaden line before the fringe. Abdomen yellow with a dark dorsal stripe. Hind wing orange-yellow with a rather narrow brown-black border; fringe whitish. Beneath both wings yellow with gray borders becoming black inwardly, the fore wing with an irregular discal mark. Expanse, 53 mm.

Type.—Male, No. 13913, U.S.N.M., Zacualpan, Mexico, June, 1910 (R. Müller).

Allied to *Gerrodes longipes* Druce, but differing in the presence of the white bar and in the outer line, which is erect and not followed by a distinct second line.

Subfamily ERASTRIINÆ.

Genus MICTOCHROA Hampson.

MICTOCHROA SELINITIS, new species.

Gray, the basal space clear and light gray; inner line curved, double, whitish showing on costa and inner margin; stigmata outlined in white, gray-filled, the reniform with a slender white center; a black dash through the cell and one on submedian, the former bisected by the reniform; outer line white, duplicated without, smooth, excurved over cell; terminal space dark but with white powdering; subterminal line white, powdery, wavy; fringe dark, white-powdered, with a straight white line at base; a terminal row of black dashes. Hind wing brownish gray. Expanse, 20 mm.

Type.—Female, No. 13943, U.S.N.M., Tehuacan, Mexico, June, 1910 (R. Müller).

Determined by Sir G. F. Hampson.

Genus EUSTROTIA Hübner.

EUSTROTIA ANITA, new species.

Basal space pearly gray; an erect black band across wing, narrow, constricted in cell and at vein 1, edged with whitish on both sides; outer portion of the wing washed with dull brownish red; costa spotted alternately ocherous and blackish; reniform an ocherous ringlet; subterminal line ocherous, strongly waved, preceded by a dark cloud on costa; a terminal black line; fringe gray. Hind wing heavily gray-shaded over a slightly ocherous ground. Expanse, 17 mm.

Type.—Female, No. 13944, U.S.N.M., Orizaba, Mexico (Schaus collection).

EUSTROTIA VICTRIX, new species.

Thorax and base of fore wing smooth pale gray; a broad black band across wing incised within slightly in cell and on vein 1, narrowly pale-edged; outer part of wing ocherous, a little clouded with olive gray; reniform a large area without any olive clouding; subterminal line dark, twice incised, partly obsolete, the two points of the incisions the most distinct, except a triangular costal mark at its inception; fringe black, incised by the ocher ground at middle and slightly so subapically. Hind wing brownish-shaded, the veins darker, the fringe pale. Expanse, 18 mm.

Type.—Male, No. 13945, U.S.N.M., Orizaba, Mexico (Schaus collection).

EUSTROTIA LIXINITES, new species.

Base of fore wing clear gray; a dark gray patch on costa, dislocated from the band on inner margin, which is very wide on the margin, narrows abruptly into a rounded point above, terminating in the cell; space beyond ochereous, much overspread with gray outwardly; costa spotted ochereous and blackish; reniform an ochereous ringlet; subterminal line black, waved, broadest on costa; a light terminal line; fringe with a black patch at middle and at anal angle. Hind wing gray, fringe light, the veins and margin darker. Expanse, 24 mm.

Type.—Male, No. 13946, U.S.N.M., Oaxaca, Mexico (Schaus collection).

EUSTROTIA MELOR, new species.

Base of fore wing gray; black band very broad, narrowing somewhat toward costa, indented in the middle a little on the outer side, edged with silvery on both sides; space beyond ochereous, strongly but irregularly shaded with blackish beyond the reniform; reniform an ochereous ellipse, scarcely defined; subterminal line pale, irregular, passing through the terminal clouding; fringe black, the color narrowly and somewhat irregularly staining the margin of the wing. Hind wing whitish in the male, with the veins dark, especially on the margin; solidly blackish gray in the female. Expanse, 18 mm.

Cotypes.—Male and female, No. 13947, U.S.N.M., Cuernavaca, Mexico, July, 1906 (W. Schaus).

EUSTROTIA MELORISTA, new species.

Base of fore wing dark gray; black band broad, narrowing somewhat above, edged on both sides with silvery and within by orange also; space beyond orange; reniform faintly indicated, paler; subterminal line silvery, waved, preceded by a patch of black shading on costa and another just below it and a very small one on submedian; terminal space brown shaded; fringe dark gray with a black line at base, broken in the middle. Hind wing blackish brown, uniform. Expanse, 17 mm.

Type.—Female, No. 13948, U.S.N.M., Iguala, State of Guerrero, Mexico, 2,400 feet, June, 1906 (W. Schaus).

EUSTROTIA DISSOCIATA, new species.

Base of fore wing pale gray, the outer two-thirds clayey ochereous; a black triangle on costa close to base, followed by a small dash; inner band broad and triangular on costa, constricted in cell, widened again below, and then constricted to a fine thread below vein 1; reniform a pale ellipse, filled and surrounded by an extensive grayish cloud; two dark dashes on costa; a triangular subapical patch; outer margin

stained by two olivaceous grayish clouds; a broken terminal black line. Hind wing dark gray, the fringe pale, shining. Expanse, 20 mm.

Type.—Female, No. 14218, U.S.N.M., Tehuacan, Mexico, September, 1910 (R. Müller).

EUSTROTIA MEGAPLAGA, new species.

Gray, mottled and irrorate with olivaceous brown; a large black patch on inner margin, its inner edge erect, outer slightly oblique, upper edge nearly parallel to cell; indistinct gray streaks from costa and a wedge-shaped mark touching the upper angle of the patch; three gray dots at reniform; a broad dark shade across wing within the subterminal line, which is pale and faint, undulate; two curved dark patches on termen, the flexures between them at apex and middle. Hind wing shaded with gray-brown, powdery, the veins darker; fringe and terminal line dark. Expanse, 23 mm.

Type.—Male, No. 13949, U.S.N.M., Tehuacan, Mexico, September, 1910 (R. Müller).

The specimen was examined by Sir G. F. Hampson and the name suggested by him.

EUSTROTIA PLUMBIFUSA, new species.

Gray, with a warm brownish tint on outer portion; basal space leaden gray, with an irregular black mark for the subbasal line; a broad leaden black band crosses the middle of the wing, angularly incised on its lower third with a point inward on vein 1 and a faint duplicating inner line; outer edge of the band roundedly but sharply incised on median vein; the band is plumbeous in the center and has black edges and a crossing bar on median vein; beyond this the ground is somewhat reddish, crossed by two slightly wavy brown lines, which become separated centrally; submarginal line brown-black, rather sharply dentate, especially mesially, followed by a whitish shade at apex; fringe leaden black, the color encroaching on the termen most widely at upper and lower thirds; a pale terminal line; a whitish speck at tornus. Hind wing gray-brown. Expanse, 22–24 mm.

Cotypes.—Three females, No. 13950, U.S.N.M., Tehuacan, Mexico, June and August, 1910 (R. Müller).

One of the specimens was examined by Sir G. F. Hampson, who suggested the name here adopted.

Genus *ERASTRIA* Ochsenheimer.

ERASTRIA TILORA, new species.

Fore wing at base ochereous brown, shading into red-brown centrally; inner line dark, curved, indistinctly doubled, black on costa; reniform a black lunule, followed by leaden and three black dashes on costa; outer line whitish, narrow, broadened, ochereous-shaded and

oblique on costa, forming two broad teeth opposite cell, then curved to inner margin, finely black-edged on both sides; terminal space soiled clay-color, obliquely brown from apex to median vein; subterminal line whitish, broadly waved and minutely crenulate, darker-edged, cutting off a small triangle from the apical dark shade. Hind wing grayish-shaded, the veins darker. Expanse, 19 mm.

Type.—Male, No. 13951, U.S.N.M., Tehuacan, Mexico, September, 1910 (R. Müller).

Genus TARACHE Hübner.

TARACHE INTERPOSITA, new species.

Head and collar white; thorax leaden gray; fore wing broadly white along the costa, the inner area leaden gray with bronzy brown scales intermixed; a broad stripe of gray crosses the costal area at basal third, and there is an indication of another at apical third; the upper edge of the gray area is expanded at the positions of orbicular and reniform, although these spots are not otherwise defined and terminally the gray runs obliquely to apex. Hind wing whitish with a wash of gray, especially on the veins and apex. Expanse, 19 mm.

Type.—Female, No. 13952, U.S.N.M., Tehuacan, Mexico, June, 1910 (R. Müller).

This species was determined by Sir G. F. Hampson, who labeled it "Near *expolita* Grote."

TARACHE VITTAMARGO, new species.

Head and collar silky white; front and thorax dark purple; abdomen whitish; fore wing dark purple, the costa broadly snow-white to apical sixth; the lower edge of the white costal stripe is a little irregular and indented, its termination is parallel to the outer margin; the dark purple field is transversely marked with two darker, more reddish lines, corresponding to the usual inner and outer lines; anal angle broadly lilacine whitish, with detached gray-purple clouds along its inner edge and with two small black spots on the termen; fringe concolorous with the adjacent markings, being dark purple on upper third, then lilacine whitish, then purple on lower third. Hind wing white with straw-yellow tint. Expanse, 25 mm.

Type.—Male, No. 14239, U.S.N.M., Tehuacan, Mexico, April, 1911 (R. Müller).

Genus LITHACODIA Hübner.

LITHACODIA MUSTAPHA, new species.

Fore wing gray, the claviform, orbicular and reniform outlined in black, but indistinct; a blackish costal wedge between the discal stigmata and a similar dark shade about the claviform; subterminal line broadly relieved by white on its lower two-thirds, itself blackish,

denticulate, not strongly contrasted; the white occurs on both sides of the subterminal line, most continuously within and bordering the outer line, which is incurved below vein 2. Hind wing pale cinereous. Expanse, 24 mm.

Type.—Female, No. 14217, U.S.N.M., Mexico City, Mexico, July, 1910 (R. Müller).

Mr. Schaus reports that this species is under *Lithacodia musta* Grote in the British Museum collection, and Sir G. F. Hampson determined a specimen as *L. musta*. I think, however, that it is clearly distinct from that well-known species of the eastern United States, although allied to it.

Subfamily CATOCALINÆ.

Genus CELIPTERA Guenée.

CELIPTERA DIMERA, new species.

Fore wing light gray on basal half, finely irrorated with darker; costal edge black, the inner line arising from it as a black dash, then continued slenderly across the wing, incurved in the middle with a central outward tooth; a black line across the middle of the wing, formed of two arcs, touching on submedian, sharply edged within, diffused without, followed by a rosy brown color that covers the outer half of the wing; reniform absorbed in the median band; subterminal line pale, wavy, edged by darker cloudings; a terminal row of obscure blackish dots; fringe paler, approaching the shade of basal area. Hind wing faintly yellowish, reddish gray on terminal third, the veins a little darker; a row of faint terminal dots; fringe whitish. Expanse, 30 mm.

Type.—Female, No. 13955, U.S.N.M., Tehuacan, Mexico, June, 1910 (R. Müller).

This specimen was determined by Sir G. F. Hampson, who placed a question-mark beside the generic determination.

Subfamily NOCTUINÆ.

Genus DYOPS Guenée.

DYOPS XANTHOLEPIS, new species.

Fore wing dark gray; basal space powdered with white with a central orange yellow dash; subbasal line black, broken, angled; inner line curved, white, dentate, with outer black edge, the white occluded except at the dentations, strongly black without the yellow basal mark; median line black, angularly dentate, suffused by a broad blackish shade that fills most of the median space; claviform a whitish shade; orbicular similar, small, a little defined on its edges by dark scales; reniform large, diffused, white, broken into three superposed spots, the middle one of which is orange yellow, and an inner spot, this latter separated by a slender line on the cross-vein; outer line black with narrow white shading without, dentate, strongly

produced opposite cell in a square, the outer edge of which is irregularly dentate; terminal space powdered with white, especially next the outer line, a little yellow shaded below; submarginal line whitish, dentate, broken and more or less dislocated; fringe concolorous with the terminal space with white basal dots. Hind wing brown-black with some irregular white scales near anal angle. Expanse, 36 mm.

Cotypes.—Two males, two females, No. 13956, U.S.N.M., Misantla, Mexico, May, 1909, May, 1910 (R. Müller).

Determined by Sir G. F. Hampson, who placed a mark of doubt by the generic name.

Genus *CASANDRIA* Walker.

CASANDRIA OLIVARIS, new species.

Costal area sordid ocherous, apparently originally olive green; inner two-thirds of wing gray; subbasal line gray, with an outward closed loop in the middle containing a few whitish scales; inner line gray with strong dentations in cell and on submedian; reniform an angular-pyriform line with central dot; outer line dislocated from a deep black mark on costa, strongly dentate, incurved below cell and remaining thence near middle of wing with a square outward production in submedian area; subterminal line whitish, clouded and obscure, but forming a white dot above tornus. Hind wing pale, washed with gray outwardly, the veins dark; fringe pale. Expanse, 31 mm.

Type.—Female, No. 13957, U.S.N.M., Misantla, Mexico, August, 1910 (R. Müller).

Determined by Sir G. F. Hampson and the name suggested by him.

Genus *PETEROMA* Schaus.

PETEROMA ALTERNATA, new species.

Basal and outer two-thirds of median spaces black, the alternating areas brownish gray; basal area somewhat obliquely limited outwardly, with indentation in cell and on vein 1, the black shading upon a browner ground and indistinctly lined; the outer dark area just covers a dentate mesial line and is limited without by the outer line, black, dentate, incurved below vein 3 and followed by brown, a wavy terminal pale line with black dots at the incisions; fringe wavy. Hind wing brown; an outer curved black line running from tornus and lost above middle of wing; the line is clouded with brown and followed by a faint reduplication; a terminal crenulate black and pale line. Expanse, 41 mm.

Type.—Male, No. 13958, U.S.N.M., Mexico City, Mexico, August, 1910 (R. Müller).

Mr. Schaus kindly examined this species and labeled it "*Peteroma*;" nothing exactly like it in British Museum."

Genus CELIPTERA Guenée.

CELIPTERA CODO, new species.

Brown, irrorated with blackish; subbasal line velvety black, obsolete below; inner line broadly curved, coarsely dentate, pale with a reddish tint, narrow, but distinctly edged with black on its oblique upper third; orbicular round, black; reniform black, clouded outwardly and throwing a spur from inferior angle back along median vein to below orbicular; outer line broad, even, gently curved, reddish brown without, shading to yellowish within, edged with a blackish line within and outwardly by a narrow yellowish line that is strongly crenulate, its cusps nearly cutting through the following clouded black band; terminal space of the ground color, not so strongly irrorate; a crenulate black line at base of fringe. Hind wing much the color of fore wing, lightening at base; a blackish shaded discal lunule; traces of a pale outer mesial line with dark edges; fringe as on fore wing. Expanse, 40 mm.

Type.—Male, No. 13959, U.S.N.M., Tehuacan, Mexico, September, 1910 (R. Müller).

Mr. Schaus examined this specimen.

Genus RHÆSENA Walker.

RHÆSENA DEFECTA, new species.

Dark brown, somewhat bronzy, with a general mottled effect from the light and dark shades and numerous lines; outer line almost at the middle of the wing, crenulate, geminate, black, pale-filled, angularly bent at cell; beyond it about vein 6 a longitudinal yellowish silvery line touches submarginal line; subbasal and inner lines black, crenulate; subterminal line pale, with a dark shade within; this shade on lower two-thirds of wing, with another similar one within the outer line, are straight, black and conspicuous; ground between the lines mottled with black; discal spots black-ringed, but lost in the general mottling; a pale terminal line; fringe black spotted; outer margin excavate below apex. Hind wing black, with a brownish tinge, uniform. Expanse, 24 mm.

Type.—Female, No. 13960, U.S.N.M., Misantla, Mexico, July, 1910 (R. Müller).

Sir G. F. Hampson kindly examined the specimen, but placed a mark of doubt by the generic reference, as the palpi are missing.

Genus GONODONTA Hübner.

GONODONTA PLUMBICINCTA, new species.

Thorax and fore wing rather dark ochereous brown; scarcely any markings to the outer line; a darker brown shade along costa, widening basally and toward apex, and two parallel oblique brown streaks

below median vein at base; the outer line is broad, beginning with a dark brown line within, which forms a tooth inward below cell and is then continued very faintly to margin; following this is another line, similar, parallel, but not entering the tooth, separated by a purplish space; next a dark leaden band, then a light one, these interrupted above tornus and replaced by a narrow ocherous lunule; a wavy line following, then a dark shade, then a narrow terminal space of the ground color; fringe dark with blackish spots. Hind wing black with a small central lightening, which is digitately expanded, and is the remains of the central yellow patch usual in the genus. Expanse, 37 mm.

Type.—Male, No. 13961, U.S.N.M., Orizaba, Mexico, September, 1910 (R. Müller).

This was determined as new by Mr. Schaus.

Genus *CONCANA* Walker.

CONCANA LEUCOMERA, new species.

Fore wing purplish brown with a bronzy reflection; inner line black, curved, squarely angled on subcosta, then nearly even; reniform and orbicular outlined in black but indistinctly so, the reniform with a faint concentric lightening that forms a faint outward ray to outer line; outer line black, starting on costa above reniform, then strongly outwardly bent, forming a square projection with slight waves, returning across the discal venules to within reniform, bent at a sharp angle and continued down to inner margin with a flexure in submedian space; at the indentation it joins the median line which is similarly outflexed, crossing the reniform, but only its segment below the junction is distinct; subterminal line pale, wavy, maculate, forming a round yellowish spot above vein 2 and crossed by a black dash near vein 6. Hind wing black, with a broad oval white space at base. Expanse, 30–35 mm.

Cotypes.—Males and females, No. 13962, U.S.N.M., Misantla, Mexico, May and August, 1910 (R. Müller); Orizaba, Mexico (Schaus collection).

Examined by Sir G. F. Hampson, who placed a question mark beside the generic determination.

Genus *ANTARCHÆA* Hübner.

ANTARCHÆA OBLIQUALIS, new species.

Thorax and fore wing yellow; palpi crimson; outer half of wing shaded with crimson, leaving a line of the ground color which starts from apex obliquely and is bent at the level of the median vein, running toward base till it is lost in the ground color; the crimson edges this line above distinctly and it also runs inward on the inner margin; all its inner border is diffused; costa narrowly crimson.

Hind wing white, a little washed with gray outwardly. Fore wing blackish shaded below with crimson fringe. Hind wing white. Expanse, 25 mm.

Cotypes.—Females, No. 13963, U.S.N.M., Tehuacan, Mexico, September, 1908 (R. Müller); Mexico City, Mexico, July, 1910 (R. Müller).

Sir G. F. Hampson suggested the specific name, and remarks that the species is near to *Antarchæa flacillalis* Walker, an undescribed species in the British Museum from Arizona

ANTARCHÆA OMA, new species.

Palpi and orbits rosy; head, thorax, and abdomen whitish yellow. Fore wing whitish yellow with a gray overcast, the costa on basal fourth deep rose color; an oblique stripe from apex of a grayish color, bent parallel to costa near its middle and becoming obsolete before reaching base of wing; the stripe is edged below by clear yellow of the ground color, without the grayish shadings; fringe darkly gray-shaded. Hind wing pale straw color. Expanse, 36 mm.

Type.—Female, No. 14237, U.S.N.M., Tehuacan, Mexico, May, 1911 (R. Müller).

Family NOTODONTIDÆ.

Genus CERURA Schrank.

CERURA DUONUMENIA, new species.

Fore wing gray, the normal white ground appearing only at base below median vein and in two large lunate marks in the submarginal line above veins 2 and 3. Several irregular black lines across the wing, barely discernible, and a discal mark; submarginal line more distinct, velvety black in places, especially apically, and in streaks beyond cell and above vein 1. The upper streak is dislocated inward and edged with white; the lower is somewhat lunate and also edged with white. A row of black dots in the fringe. Hind wing grayish, darkly on the veins and margin, the fringe whitish with dark spottings. A discal dot and mesial line showing through from beneath. Expanse, 32 mm.

Type.—One male, No. 13861, U.S.N.M., Tehuacan, Mexico, September, 1910 (R. Müller).

Genus SCHIZURA Doubleday.

SCHIZURA DOSPEPPA, new species.

Fore wing reddish gray; base shaded with blackish, especially subcostally; no markings beyond, except the lower half of the outer line, which is pale, wavel and slightly bordered with blackish; sub-

terminal line distinct, whitish, waved, edged with blackish, forming a white speck above vein 2, crossed by black streaks on veins 2 to 4 and followed by shorter streaks above. Hind wing white, a little yellowish shaded; a black spot above tornus cut by a pale line. Expanse, 33 mm.

Type.—Male, No. 14076, U.S.N.M., Iguala, State of Guerrero, Mexico, 2,400 feet, June, 1906 (W. Schaus).

Family EUPTEROTIDÆ.

Genus APATELODES Packard.

APATELODES HIANTHA, new species.

Gray, the body dark gray, the patagia outlined in darker; fore wing with the inner line waved, geminate, obsolete except on inner margin, where it shows as two whitish cusps preceded by black; an oblique black line in brown shading from basal third of costa, directed toward tornus, which it does not reach; discal dot a whitish lunule; mesial line brown-black, angled outward over the discal mark, crossing the oblique streak below, not wavy; outer line crenulate, excurved a little above; a submarginal apical white line, its lower edge broken off as a round dot, preceded by black, longitudinally streaked; fringe concolorous with ground, which is darker terminally. Hind wing reddish gray with a curved whitish mesial line and dark scaling on the inner margin. Expanse, 34 mm.

Type.—Male, No. 13914, U.S.N.M., Zacualpan, Mexico, August, 1909 (R. Müller).

APATELODES DORAMIA, new species.

Gray, a brown-black band on posterior edge of thorax; abdomen densely irrorated with brown. Fore wing gray, shaded with brown in lower part of median space; a brown spot on inner margin, cut by an outwardly oblique white line; an oblique white line from basal third of costa, directed toward tornus, edged with brown; discal mark a whitish ellipse; mesial line indicated by a dark dash on costa; outer line whitish, not wavy, excurved in its upper third; a broken costo-subapical white line, preceded by two heavy black dashes. Hind wing reddish gray, with curved mesial white line, intensified on inner margin and bordered there by brown scaling. Expanse, 38 mm.

Type.—Male, No. 13915, U.S.N.M., Cuernavaca, Mexico, July, 1906 (W. Schaus).

APATELODES LESCAMIA, new species.

Gray; base of thorax with a black band; abdomen with a dorsal row of spots. Fore wing dark gray, the basal area lighter, limited outwardly by a line formed of the oblique streak on inner margin

and the oblique costal streak, which join; inner marginal one narrow, white, preceded and followed by black; costal one white, shaded, followed by black, the two meeting in a point; discal dot elliptical, pale; outer line whitish, not waved, sharply excurved above, dark-edged within; a broken whitish costo-subapical line with shaded black streaks within. Hind wing reddish gray, with a faint pale line before the middle, becoming white on inner margin and there edged by dark scales. Expanse, 32 mm.

Type.—Male, No. 13916, U.S.N.M., Tehuacan, Mexico, August, 1910 (R. Müller).

APATELODES BATIMA, new species.

Cinereous gray, the fore wing mottled with olivaceous brown; spot on inner margin brown, divided by a pale line; inner line brown, curved, throwing out at median vein an oblique streak, directed toward tornus; mesial line brown, shaded near the inner line; discal mark a faint pale cloud; outer mesial line brown, shaded, sharply excurved opposite cell and again slightly at submedian; outer line narrow, blackish, excurved opposite cell; a brown cloud on outer margin starting below the costo-apical white dots, which are preceded by brown. Hind wing washed with dull red, with mesial white line, preceded by a faint red one, all intensified on inner margin. Expanse, 44 mm.

Type.—Female, No. 13917, U.S.N.M., Iguala, State of Guerrero, Mexico, 2,400 feet, June, 1906 (W. Schaus).

This species was determined as new by Mr. Schaus and sent to me for description.

APATELODES BUNCA, new species.

Brownish tan-color; tarsi marked with brown. Fore wing with the inner line black-brown, crenulate, interrupted in the middle, preceded by a geminate brown spot on inner margin; inner mesial line brown, wavy, faint; outer mesial line brown, clouded on inner margin by a large irregular patch; outer line narrow, black-brown, crenulate, excurved opposite cell, followed by patches of brown shading below; a white speck submarginally opposite the indentation on the outer edge of the wing; terminal shading and fringe brown. Hind wing shaded with reddish, the inner margin marked with a white cusp and brown dashes. Expanse, 46 mm.

Type.—Male, No. 13918, U.S.N.M., Cuernavaca, Mexico, June, 1906 (W. Schaus).

APATELODES MILMA, new species.

Grayish carneous; a velvety brown spot on collar and middle of thorax, expanding on posterior edge; fore wing with a mark on basal third of inner margin composed of two superposed spots within,

followed by a short erect line; inner line brown, outwardly bent on median, then to inner margin, slightly flexuous; a brown cloud on outer half of inner margin, rising nearly to the cell and joining the faint mesial shade-band; outer line brown, dentate-lunulate, excurved below costa and parallel to outer margin; fringe brown; subapical mark a small white dot well below costa. Hind wing reddish except at base, with faint pale mesial line, which bears a brown spot on inner margin. Expanse, 45 mm.

Type.—Male, No. 14030, U.S.N.M., Jalapa, Mexico (Schaus collection).

Mr. Schaus writes that this species is under *A. heptaloba* Druce in the British Museum collection, but that it is really distinct from that species.

Family GEOMETRIDÆ.

Genus EPIRRHOE Hübner.

EPIRRHOE CALISCATA, new species.

Fore wing gray, rather thinly scaled, with a broad black mesial band. Other markings less distinct. Basal space dark, limited outwardly by a double blackish line; median band limited inwardly by a blackish line, coarsely angulated on the veins and interspaces, with a whiter area preceding above vein 1; beyond this band and below vein 2, a red-brown line; outer line dark, shaded, waved, obsolete centrally, joining at tornus a broad dark marginal shade, also incised centrally. Hind wing white, nearly pure, with three black dashes on inner margin and a subterminal gray shaded line. Expanse, 30 mm.

Type.—Male, No. 14222, U.S.N.M., Zacualpan, Mexico, September, 1909 (R. Müller).

Genus EMMILTIS Hübner.

EMMILTIS ORDINARIA, new species.

Creamy white, slightly gray-tinted on costa and veins; lines fine, wavy pale gray; five lines, inner and mesial well spaced, outer three close together near the margin, the inner of these three a little blacker and more dentately waved; a minute discal dot; fringe dark. Hind wing similar, the inner line faint, the mesial within the discal dot, the outer three less closely spaced than on fore wing. Expanse, 19 mm.

Type.—Female, No. 14223, U.S.N.M., Orizaba, Mexico, September, 1909 (R. Müller).

Genus *PROGONODES* Warren.*PROGONODES DIVERSATA*, new species.

Green; head and collar white; abdomen white with dorsal dark shading and tufts. Fore wing with the costa white, powdered with green; a broad white subbasal band; a slender mark on the bent discal vein; an outer white band, excurved over the discal venules, its inner edge dentate, its outer edge diffused above and duplicated by small dentations, narrow at veins 3 and 4, broadly diffused to tornus below and containing an upright blackish macular shade; a wavy white terminal line; fringe outwardly pale. Hind wing similarly marked, the outer line less dentate inwardly and running up along inner margin to base, the black marking at tornus small. Expanse, 30 mm.

Type.—Male, No. 14224, U.S.N.M., Tehuacan, Mexico, September, 1910 (R. Müller).

Genus *ISCHNOPTERIX* Hübner.*ISCHNOPTERIX CONSTANTIA*, new species.

Light gray with a russet tinge, irrorated with blackish; inner line black, single, erect from inner margin to subcostal, then bent at a rounded right angle to costa toward base; outer line oblique from costa, then roundedly bent at less than a right angle to inner margin, arcuate inward between veins 1 and 2, with a point on vein 1; a black dash parallel to costa reaching outer margin below apex, diffused below and with whitish suffusion above before apex; a slight whitish suffusion near tornus; a fine terminal black line. Hind wing more uniformly russet-tinged, with a whitish dilution at apex; a mesial blackish line angled in the discal region and a little flexuous. Thorax dark, abdomen gray, collar dull ocher. Expanse, 47 mm.

Type.—Female, No. 14225, U.S.N.M., Tehuacan, Mexico, September, 1910 (R. Müller).

Genus *OPISTHOXIA* Hübner.*OPISTHOXIA CASSANDRA*, new species.

Russet purple, darker on the outer half of fore wing; a yellow bar on costa at basal third and a larger one beyond middle; a yellow line along inner margin, expanding triangularly opposite the outer costal spot; fringe russet at base, yellow outwardly. Hind wing with a subbasal yellow band that widens into a costal streak; an outer costal spot; termen and fringe yellow, the outline undulate; surface of the wing with transverse blackish strigæ and some leaden-colored scales before termen; a small black ocellus with yellow ring and metallic center subapically; some black accompanying the submarginal leaden

spot below vein 6. Beneath uniform silky whitish, the markings showing by transparency. Expanse, 24 mm.

Type.—Female, No. 14226, U.S.N.M., Misantla, Mexico, April, 1911 (R. Müller).

This may be a variety of *O. limboguttata* Felder with the basal and terminal markings of fore wing confluent.

OPISTHOXIA SALUBREA, new species.

Russet purplish gray, the markings yellow, shaded with orange; costa diffusely yellow from base, forming a large triangular mark subapically; a broad band from beyond middle of inner margin running upward to vein 4, rounded above and constricted centrally; margin orange shaded. Hind wing with the basal gray area sharply limited, the orange yellow disk beyond irrorated with purple and metallic scales; a small round ocellus subapically and still smaller one on margin below vein 6; area around upper ocellus somewhat clear of irrorations; fringe yellow. Expanse, 26 mm.

Type.—Female, No. 14227, U.S.N.M., Misantla, Mexico, August, 1910 (R. Müller).

Genus PHYLLODONTA Warren.

PHYLLODONTA EMERITA, new species.

Gray or reddish; in one specimen the reddish color is confined to the basal space, in the other it covers the whole wing; inner line curved, wavy, olive brown, marked with glaucous, becoming blackish on inner margin; a short oblique brown line from costa mesially, ending beyond the small discal dot; outer line angled below costa, then straight, blackish, lined with glaucous, followed by small brown triangular marks; apex pointed; outer margin with a deep sinus below vein 3. Hind wing reddish gray or orange gray, with dark discal spot and mesial band; margin broadly gray, separated by a row of spots of the ground color from an outer gray band; margin with a sinus as on fore wing. Expanse, 44 mm.

Cotypes.—Two females, No. 14296, U.S.N.M., Misantla, Mexico, June, 1910 (R. Müller); Jalapa, Mexico (Schaus collection).

PHYLLODONTA PERIBLEPTARIA, new species.

Wood-brown, finely irrorate with dark brown; lines brown, straight; inner line bent at right-angles subcostally; a minute discal dot; outer line oblique, without angulation, sending a long ray toward cell subcostally; an erect shade from tornus; outer margin projecting centrally, incised between the veins below. Hind wing with a line very near the base; mesial line straight, distinct; area beyond it slightly purplish shaded, darker at the anal angle; margin as on fore wing. Expanse, 38 mm.

Type.—Female, No. 14297, U.S.N.M., Misantla, Mexico, July, 1910 (R. Müller).

Genus DIGONODES Warren.

DIGONODES GNORIMARIA, new species.

Dark umber brown, the veins of fore wing lighter; inner line slightly curved, whitish, edged without with a black shading; discal mark a black ellipse, its center nearly occluded; outer line angled at vein 4, incurved above and below the angle, fine, white, with narrow black edging; outer margin irregular, with prominences at vein 4, vein 6, and apex. Hind wing grayer brown, with round dark discal dot; outer mesial dark line with pale outer border, angled at vein 4. Expanse, 49 mm.

Type.—Female, No. 14243, U.S.N.M., Orizaba, Mexico, August, 1910 (R. Müller).

DIGONODES AGONARIA, new species.

Light wood-brown, but heavily mottled with blackish brown, the mottlings generally completely confluent in the outer part of the median space; inner line wavy, clouded, partly lost in the mottlings; a discal black ringlet; outer line projecting in the middle, wavy, edged without by a slightly paler line, which in dark specimens forms the outer edge of the shaded median space; margin pale but mottled with dark and with a dark subapical patch. Hind wing similar to fore wing, the markings less pronounced; discal dot black; outer line crenulate, preceded by dark shading; margin more clear of mottlings than the rest of the wing. The outer margins of both wings are entire, without angulations. Expanse, 39–41 mm.

Cotypes.—One male, six females, No. 14294, U.S.N.M., Cuernavaca, Mexico, June, 1906 (W. Schaus); Santa Rosa, State of Vera Cruz, Mexico, August, 1906 (W. Schaus); Zacualpan, Mexico, August, 1910 (R. Müller)

Genus PARAGONIA Hübner.

PARAGONIA TISELAARIA, new species.

Pale wood-brown; both wings densely mottled with dark red-brown from base to outer line, finely strigose beyond; inner line dark brown, bent subcostally, slightly flexuous; a small round discal dot; a semi-circular purple-brown patch on costa before apex, from which the outer line is disconnected, but becomes distinct below; brown, slender, sending out lines along the veins, the spaces between filled with large olive patches; a submarginal row of olive patches, larger toward tornus. Hind wing with the mesial line followed by purplish and stained with olive; submarginal line olive, widening toward tornus; a slight angulation in the middle of each wing; antennae of male simple. Expanse, 37 mm.

Type.—Male, No. 14295, U.S.N.M., Zacualpan, Mexico, January, 1911 (R. Müller).

Genus *APICIA* Guenée.*APICIA ISCHYZOARIA*, new species.

Fore wing with the apex pointed, the outer margin angled at vein 4; straw-color, more or less distinctly tinged with brown; lines nearly straight, approximating on inner margin, whitish, edged with brown within, the brown edging usually more obvious than the line itself; a rounded black discal dot; basal and terminal spaces dusted with purplish black irrorations, which form large clouded spots, one in center of basal space, three following outer line and one within the angle of the outer margin. These spots are sometimes confluent, sometimes faint. Hind wing with a single mesial line, followed by a central spot, which may be duplicated toward inner margin or have small patches toward apex and outer margin; discal dot present or absent. Expanse: Male, 31 mm.; female, 37 mm.

Two males are dark rusty brown with the patches pale purplish and confluent. The females are both pale, with the patches pale purplish and confluent, but faint.

Cotypes.—Nine males, two females, No. 14244, U.S.N.M., Mexico City, Mexico, February, May, June, September, October, December, 1908, 1909, 1910 (R. Müller).

Mr. Schaus kindly examined both sexes of this species. The female he found to resemble *Therina ascolia* Druce, while the male might be easily mistaken for one of the forms of the female of *Apicia distycharia* Guenée. The species comes very close to *Tetracis pagonaria* Schaus, which is represented in the collection by females without any traces of the purplish patches. In the females of *ischyzoaria* before me the purplish markings are much fainter than in the males, and it is possible that they may disappear.

Genus *THERINA* Hübner.*THERINA CALIDARIA*, new species.

Wings semitranslucent pale brownish straw-color, densely irrorate with purple brown; lines purple brown, edged with dark ocher, narrow, slightly spotted on the veins, the outer line incurved a little below cell; a dark discal mark. Hind wing with a single outer mesial line like those on fore wing. Expanse, 35 mm.

Cotypes.—Three females, No. 14245, U.S.N.M., Zacualpan, Mexico, August, 1909, 1910 (R. Müller).

Genus *TRYGODES* Guenée.*TRYGODES SIMPLICISSIMA*, new species.

Wings translucent whitish, thickly irrorated with pale gray, the irrorations largely confluent; fore wing with two lines of gray, wavy, approximate, subparallel; hind wing with a single mesial line;

a dark line on margin of both wings; outer margin angled at vein 4 on both wings. Expanse, 36 mm.

Type.—Female, No. 14246, U.S.N.M., Orizaba, Mexico, November, 1907 (R. Müller).

Genus *METANEMA* Guenée.

METANEMA UGALLIA, new species.

Orange-ocherous, darker on the margin; lines of fore wing straight, parallel, oblique, purplish brown; a small discal dot; outer margin angled at vein 5, the part above the angle slightly excavate. Hind wing with discal dot and faint reddish outer mesial line, the margin slightly angled. Expanse, 29 mm.

Type.—Male, No. 14247, U.S.N.M., Zacualpan, Mexico, August, 1909 (R. Müller).

Genus *ACANTHOPHORA* Hulst.

ACANTHOPHORA MUELLERI, new species.

White, speckled with black. Collar lined with black behind; abdomen spotted; tarsi broadly ringed. Fore wing with numerous strigose spots, which are clustered more densely in the regions of the usual transverse lines; a terminal row of spots. Hind wings lightly spotted, the spots grayish except along the margin. Beneath both wings are lightly spotted, the spots tending to form an outer mesial row. Expanse, 36 mm.

Type.—Female, No. 14248, U.S.N.M., Mo'bano, Mexico, August, 1910 (R. Müller).

Genus *PIGIA* Guenée.

PIGIA CALOTIS, new species.

Ground color white with an ocherous tint about the lines; basal space powdered with brown; inner line single, brown, angled in cell, a little waved only below; median vein and venules brown-lined; discal cross-vein brown; median line straight, sharply angled at vein 6, followed by a fainter parallel line, in the female by two such; these duplicate lines are finely dentate on the veins; outer line slender, brown, angled at vein 6, incurved below, then outcurved and inward again at submedian fold; a brown line from apex touches the angle at vein 6, most evident in the female; terminal space below this dash filled in with brown except for a series of lunate submarginal intravenular white patches; a fine brown terminal line. Hind wing similarly ornamented; two mesial lines, the second followed by a single line (in the male) or by two (in the female); outer line irregular, the terminal space filled with brown scaling except for the submarginal spots. Expanse, 18–19 mm.

Cotypes.—Two males, No. 14284, U.S.N.M., Iguala, State of Guerrero, Mexico, June, 1906 (W. Schaus); one female, Tehuacan, Mexico, September, 1909 (R. Müller).

HEMITHEINOPSIS, new genus.

Fore wing with vein 3 from well before 4; 5 from middle of cross-vein; 6 from end of cell; a long accessory cell formed from the anastomosis of 11 and 12 with the stalk of 7-8 and crossed by 9 which is weak; 7 from the accessory cell; 8-9 stalked from its end; 10 from the accessory cell near its end; 11 from it also; 12 arising from base, but leaving the accessory cell before the anastomosis. Hind wing with vein 5 absent, 6 and 7 separate, 8 anastomosing with subcostal to beyond middle of cell. Legs slender; hind tibiae with four spurs and a groove containing a hair-pencil. Antennae of male bipectinate.

Genotype.—*Hemitheinopsis pteroglaucæ*, new species.

This genus falls in the Geometrinæ according to Prout¹ or the Fernaldellinæ according to Hulst,² but does not seem at all allied to the latter.

HEMITHEINOPSIS PTEROGLAUCA, new species.

Head and thorax tinged with green, abdomen whitish. Fore wing pale yellow-green, faintly mottled with white; two straight, parallel, white lines, oblique, the inner from inner third of inner margin to middle of costa, the outer from outer third of inner margin to costa close to apex. Hind wing white with a very faint greenish tinge. Expanse, 29 mm.

Type.—Male, No. 14290, U.S.N.M., Zacualpan, Mexico, September, 1909 (R. Müller).

HEMITHEINOPSIS PTEROCHRA, new species.

Thorax tinged with ocher brown, darkest in front; abdomen white. Fore wing pale ocher brown, finely irrorated with darker; two parallel pale lines as in the preceding species, edged toward the center with darker brown, which is a little intensified on the veins. Hind wing creamy whitish, semitransparent. Expanse, 29 mm.

Type.—Male, No. 14291, U.S.N.M., Zacualpan, Mexico, February, 1911 (R. Müller).

Genus ANNEMORIA Packard.**ANNEMORIA ORTHOGRAMMA, new species.**

Fore wings green, finely irrorated with transverse white strigæ; two parallel broad white bands, the outer reaching the costa close to apex. Hind wing tinted with green except in an outer mesial line. Expanse, 29 mm.

Cotypes.—Male and female, No. 14287, U.S.N.M., Mineras de Zacualpan, December, 1910, March, 1911 (R. Müller).

Similar to *A. bistriaria* Packard, but the white bands on fore wing are broader.

¹ Gen. Ins., Lep., 103 fasc., 1910, p. 10.

² Trans. Amer. Ent. Soc., vol. 23, 1896, p. 249.

Genus BLECHROMA Möschler.

BLECHROMA TISSTIGMARIA, new species.

Both wings green, marked with purple brown lines: Fore wing with the costa brown, especially beneath; an inner line strongly crenulate, tending to form points at the ends of the indentations; a large round discal mark surrounded by crenulations, being the upper segments of two lines that join above it; outer line similar to the inner, more strongly crenulate and largely obsolete except the dots at the ends of the indentations, appearing as two alternating rows of dots, the inner one nearest the costa larger and blurred. Hind wing with traces of both lines adjoining the inner margin and faint indications beyond; a row of small terminal dots on both wings. Expanse, 27 mm.

Type.—Male, No. 14288, U.S.N.M., Misantla, Mexico, May, 1910 (R. Müller).

The specimen was examined by Mr. Schaus, who states that the species is in the British Museum without name.

Genus RACHEOSPILA Guenée.

RACHEOSPILA MANOSTIGMA, new species.

Vertex of head white, front purple; body green, the abdomen with large dorsal white spots edged with purple. Wings green; fore wing with the costa narrowly purple; three dots in a curved line representing the inner line; a round discal spot; seven dots representing the outer line, a little alternately waved. Hind wing with discal dot and traces of an outer row of dots. Both wings with a narrow red terminal line, the fringe white. Expanse, 25 mm.

Type.—Female, No. 14289, U.S.N.M., Misantla, Mexico, May, 1910 (R. Müller).

Mr. Schaus examined the specimen and labeled it "*Racheospila*, sp., not in British Museum."

CÆNOSYNTELES, new genus.

Fore wing with vein 3 well before 4; 5 from the middle of the cross-vein; 6 from the end of the cell; 7-10 stalked, without accessory cell, 8 and 9 running to the costa well before apex (nearer the apex in the male than in the female); 11 from the cell; 12 free. Hind wing with vein 5 distinct, from the middle of the cross-vein; 6 and 7 stalked; 8 free from the cell but running very close to it in the middle. Antennæ of the male thickened and flattened; somewhat so also in the female. Vestiture long, hairy. Hind tibiæ with one pair of spurs. Eyes moderate. Palpi hardly exceeding the front.

Genotype.—*Cænosynteles haploaria*, new species.

This genus falls in the Brephinae, both by Hulst's and Prout's tables, where I feel obliged to leave it, though the appearance of the single species is quite unlike that of the other Brephinae.

CENOSYNTELES HAPLOARIA, new species.

Gray; fore wing and thorax thickly gray-powdered on a whitish ground, which appears narrowly edging the lines outwardly from the median space; lines dark gray, densely but coarsely waved, the inner bent on median vein, the outer nearly straight; a small black discal dot near the outer line. Hind wing grayish, darker on the margin, with a dark mesial shaded line followed by whitish. Expanse, 32-40 mm. Abdomen with a dull ochraceous tint.

Cotypes.—Two males, four females, No. 14293, U.S.N.M., Tehuacan, Mexico, June, 1910; Zacualpan, Mexico, August, 1909 (R. Müller).

Genus CENOCHARIS Hulst.

CENOCHARIS HOPLITARIA, new species.

Whitish gray at base, along costa, in a subapical dash and discal mark, the rest of the wing carneous gray; basal space limited outwardly by a black line, dentate on vein 1 and in cell, obsoletely traversing the whitish costal area; discal mark partly surrounded by black, angular, narrow in the male, broader in the female; an outer double blackish line, distinct only below, washed and shaded along the veins above; a dark terminal line in the female. Hind wing fuscous stained, with a mesial dentate blackish slender line, followed by a dilution of the ground color. This mark not visible in the female. Beneath pale grayish, shining, immaculate. Expanse: Male, 29 mm.; female, 33 mm.

Cotypes.—Four males, one female, No. 14228, U.S.N.M., Tehuacan, Mexico, June, September, and October, 1910 (R. Müller).

Genus ALCIS Curtis.

ALCIS CRETAFUNDA, new species.

Chalky whitish, irrorated with black and ochereous brown; head and thorax dark; abdomen pale with dorsal spottings. Fore wing with the basal space solidly filled in with dark irrorations, leaving a narrow dilution before the inner line; a collection of irrorations in the center of costa; outer line slender, black, finely denticulate, incurved below vein 2; apex with several patches of black and brownish, leaving an irregular subapical mark of the ground color; subterminal line whitish, wavy, contrasted among the dark patches above, lost below; a row of terminal black dots between the veins. Hind wing similarly irrorated, with small dark discal dot and mesial denticulate submacular line, lost above; below it on inner margin a black dot followed by orange scales; terminal area grayish clouded, relieving a

whitish line, irregularly undulate; black intervenular spots connected by a fine terminal black line. Expanse, 35 mm.

Type.—Male, No. 14229 U.S.N.M., Misantla, Mexico, June, 1910 (R. Müller).

ALCIS ELPIDATA, new species.

Thorax dark, blackish gray; abdomen brown-gray. Fore wing blackish-shaded over a gray ground, which appears with a reddish tint in a quadrate area beyond cell and below middle of outer margin; lines lost in the general shading, the inner faintly traced, the outer excurved beyond the discal dilution; a black elliptical discal mark; discal veins black-lined; subterminal line whitish, wavy and flexuous. Hind wing with a straight dark shade across cell; a minute discal dot; an outer curved black line, followed by a fainter duplication; a submarginal dark irregularly wavy line preceded and followed by faint whitish macular shadings. Expanse, 30 mm.

Type.—Female, No. 14230, U.S.N.M., Tehuacan, Mexico, September, 1910 (R. Müller).

Possibly this is the female of the following species.

ALCIS INTERBRUNNEA, new species.

Thorax dark, blackish gray; abdomen brown-gray. Fore wing rather dark gray, reddish brown in lower third of median space, beyond cell and distinctly and broadly so on termen; lines black, rather broad, single; inner line excurved at cell, then retracted to basal fourth of inner margin; a faint mesial shade line with black inception on costa; an occluded black discal ringlet; outer line excurved over cell, strongly incurved below, cut by black dashes on veins 3 and 4; these dashes join the black subterminal line, which is far from margin and near the outer line; it is subparallel to the outer line but less strongly flexed and followed by a faint dilution before the brown terminal area. Hind wing with a straight dark shade across cell; a minute discal dot; an outer curved black line followed by a faint duplication; a submarginal dark irregularly wavy line followed by a faint dilution, the termen brown shaded. Expanse, 29 mm.

Cotypes.—Thirty-four males, No. 14231, U.S.N.M., Tehuacan, Mexico, June, August, and September, 1910 (R. Müller).

Family LASIOCAMPIDÆ.

Genus CLAPHE Walker.

CLAPHE NYSTAMMA, new species.

Fore wing light gray, overspread with brown; subbasal, inner and outer lines gray-black, doubled, shaded, the veins also partly black-lined; submarginal line a row of closely placed and rather large dots, with an inflexure opposite cell and submedian; a row of brown spots in the fringe. Hind wing dull yellowish, the basal half shaded

with red; a blackish shaded mesial band, broad on costa, becoming obsolete below; a subterminal row of spots as on fore wing, becoming obsolete at anal angle. Thorax and base of abdomen blackish gray with some red intermixed; abdomen mostly dull reddish. Expanse, 33–34 mm.

Cotypes.—Males, No. 13954, U.S.N.M., Orizaba, Mexico, November, 1910 (R. Müller); Cordoba, Mexico, May, 1906 (W. Schaus).

Mr. Schaus compared the Cordoba specimen and marked it "*Claphe boresa* Schs. ? larger than the specimen in the British Museum." The species is allied to *Claphe boresa*, but differs in detail.

Superfamily TINEOIDEA.

Family NOLIDÆ.

Genus RÆSELIA Hübner.

RÆSELIA PEDANTA, new species.

Fore wing grayish white; inner line slender, brown, roundedly angled on median vein; a dark shade along costa, most distinct mesially; outer line oblique from costa over the discal venules, then bent and reentrant at vein 2, then oblique and double to middle of inner margin; subterminal line black, shaded, oblique and waved from outer third of costa, incurved opposite median vein, then thickened and below paralleled to outer margin; irregular marginal brown stains except at apex. Hind wing fuscous shaded, lighter on the disk. Expanse, 28 mm.

Type.—Female, No. 14032, U.S.N.M., Misantla, Mexico, May, 1910 (R. Müller).

Family COCHLIDIIDÆ.

Genus EUCLEA Hübner.

EUCLEA POASICA, new species.

Dark brown, broadly darker on termen and below cell; discal mark elongate, dark brown; a straight subapical silver dash at the edge of the dark termen; an elliptical patch of reddish raised scales above the middle of the inner margin. Hind wing lighter brown. Expanse, 27 mm.

Type.—Male, No. 14078, U.S.N.M., Mount Poas, Costa Rica, May, 1909 (W. Schaus).

EUCLEA DISTRAHENS, new species.

Dark velvety brown, with darker streaks at base and within the two silvery streaks; discal dot round, dark brown; subapical silvery mark straight, followed by a lightening of the ground; subbasal silvery line straight, slightly outwardly oblique below, followed by an

illy defined light reddish patch; veins outwardly lined in dark. Hind wing lighter brown. Expanse, 27 mm.

Type.—Male, No. 14079, U.S.N.M., Sixola River, Costa Rica, December 3, 1909 (W. Schaus).

EUCLEA BUSCKI, new species.

Thorax dark red-brown; abdomen blackish brown. Fore wing blackish brown with a thin semihyaline aspect between all the veins over the disk; apex red brown, as also the extreme tip of outer margin; a fine red-brown line the length of vein 1; a faint pale line parallel to the outer margin, within which on the discal venules is a small pale area; discal dot black, elongate; subapical silvery mark composed of two or three dots; subbasal silvery mark a slender line, oblique in its general course and strongly looped inward in its middle third. Hind wing blackish brown, reddish shaded on the costa. Expanse, 21 mm.

Type.—Male, No. 14285, U.S.N.M., Cabima, Panama, May, 1911 (A. Busck).

I have named this species in honor of Mr. August Busck, the collector.

Genus METRAGA Walker.

METRAGA COLLE, new species.

Blackish brown, lighter over the disk, relieving the round blackish discal spot; subbasal line violaceous silvery, preceded and followed by velvety black; subapical line also violaceous silvery but slender and indistinct; a curved dark line connecting them. Hind wing chocolate brown. Expanse, 21 mm.

Type.—Male, No. 14080, U.S.N.M., Carillo, Costa Rica, October 1908 (W. Schaus).

METRAGA BYRNE, new species.

Sandy yellowish brown; a narrow pale line nearly parallel to outer margin at outer third of wing, indistinct except centrally; fringes pale. Hind wing uniform brown. Expanse, 17 mm.

Type.—Male, No. 14081, U.S.N.M., Sixola River, Costa Rica, March, 1909 (W. Schaus).

Genus SEMYRA Walker.

SEMYRA EUCARISTA, new species.

Reddish brown; subbasal silvery line at inner fourth of wing, showing two angles, the points and ends of the line slightly enlarged, making four spots united by a zigzag line; a red patch in the uppermost angle; outer line defined by black within, oblique outwardly on costa, angled inward on median, followed by a purplish shade that makes digitate projections on the middle third of the wing; subter-

minimal line curved at apex, silvery, cutting off a dark brown patch at apex, then obliquely toward inner margin, but lost below; an angular velvety brown patch between this and the digitate projections near middle of wing. Hind wing red-brown. Expanse, 25 mm.

Type.—Female, No. 14082, U.S.N.M., “unf. Brésil.” (collector unknown).

NAROSOPSIS, new genus.

Antennæ of the male bipectinated at the base, the terminal third coarsely serrate; palpi upturned to the middle of the front, thick, the end joint short; veins 2 and 3 of fore wing well separated; spurs of the mid tibiæ long and distinct; vein 7 of fore wing from the cell; thorax with posterior truncated tuft.

Genotype.—*Narosopsis leucospila*, new species.

NAROSOPSIS LEUCOSPILA, new species.

White; fore wing outwardly shaded with purplish brown in which are scattered blackish scales forming a line from costa before apex toward tornus. Hind wing grayish shaded, especially on the veins. Expanse, 17 mm.

Type.—Male, No. 14083, U.S.N.M., Sixola River, Costa Rica, September, 1909 (W. Schaus).

Genus EUPROSTERNA Dyar.

EUPROSTERNA HOSIA, new species.

Bronzy brown, the apex purplish brown, shaded; two indistinct parallel dark lines across the wing. Hind wing dark chocolate brown. Expanse, 17 mm.

Type.—Male, No. 14084, U.S.N.M., Carillo, Costa Rica, August 2, 1909 (W. Schaus).

Genus NATADA Walker.

NATADA MICHORTA, new species.

Head and collar shaded with orange; else carneous brown; fore wing lustrous silky brown with transverse impressed lines, somewhat irrorate with dark scales, the base and anal angle with a slight orange tint, the apex purplish; outer margin shallowly emarginate on upper half. Hind wing uniform brown. Expanse, 25 mm.

Type.—Male, No. 14085, U.S.N.M., Esparta, Costa Rica, May 25, 1908 (W. Schaus).

NATADA NINDLA, new species.

Head and collar broadly yellow, the color invading the center of the thorax; rest of thorax dark purplish brown; fore wing of the same dark brown; a blackish patch at lower angle of cell and one

on inner margin below it; region around these marks somewhat darker shaded; a dark line from outer fourth of costa curves outward to outer margin above tornus with a branch obliquely inward to inner margin beyond middle. Hind wings and abdomen light silky brown. Expanse, 28 mm.

Type.—Male, No. 14086, U.S.N.M., Sixola River, Costa Rica, March, 1909 (W. Schaus).

Genus *EPIPEROLA* Dyar.

EPIPEROLA CONFORMIS, new species.

Dark purplish brown; a pale oblique line from costa before apex to middle of inner margin; beyond it the ground color is lighter than within. Hind wing brown, lighter at the base. Expanse, 24 mm.

Type.—Male, No. 14087, U.S.N.M., Colima, Mexico (J. Doll).

EPIPEROLA PAIDA, new species.

Ocherous whitish; thorax intermixed with brown and blackish-tipped scales. Fore wing densely irrorated with brown, nearly obscuring the ground color, which shows most along the margin and in lined at the base; a rounded dark discal dot; a mesial curved line, slender, pale, parallel to the outer margin though remote from it, slightly defined by darker inwardly and followed by a broad brown shade; fringe dark, but lighter at the anal angle. Hind wing of the pale ground color, with a small dark patch at the anal angle. Expanse, 16 mm.

Type.—Male, No. 14286, U.S.N.M., Trinidad River, Panama, May, 1911 (A. Busck).

Genus *PEROLA* Walker.

PEROLA PRODUCTA, new species.

Fore wing long, produced, the outer margin strongly oblique, the inner margin short; yellowish ocher, the costa broadly shaded with red-brown; two parallel bands of this color from either side of apex to inner margin near base, the submarginal band fainter than the mesial one. Hind wing shaded with red-brown; body parts darker than the wings. Expanse, 40 mm.

Type.—Male, No. 14088, U.S.N.M., Tuis, Costa Rica, June (W. Schaus).

PEROLA BREVICORNIS, new species.

Antennæ very short; fore wing trigonate; ground whitish straw-color, the costal third broadly shaded with dark brown; inner half of inner area shaded with ocherous, leaving the pale ground in a triangle resting on outer margin; cell marked with darker streaks, one such

beyond it; a dark line from apex curves inward to vein 6, then downward curving across the light field into the ocherous area where it ends parallel to inner margin, crenulate, followed by a lighter area; from vein 6 a branch runs out nearly to margin, then is continued as a row of submarginal dots toward tornus. Hind wing whitish straw-color, dusted with brown, especially on inner margin; veins darker. Expanse, 38 mm.

Type.—Male, No. 14089, U.S.N.M., Tuis, Costa Rica, June, 1909 (W. Schaus).

MICROPHOBETRON, new genus.

Antennæ long, thickened and flattened, simple; hind tibiæ with four long spurs; palpi upturned, not reaching vertex; form slender, abdomen short, tapering; head small but prominent; fore wing with veins 8-9 stalked, all the rest from the cell.

Genotype.—*Microphobetron rebella*, new species.

MICROPHOBETRON REBELLA, new species.

Bronzy brownish black, the hind wings a little lighter than the fore wings. Expanse, 11.5 mm.

Type.—Male, No. 14090, U.S.N.M., Sixola River, Costa Rica, March, 1909 (W. Schaus).

Genus VIPSOPHOBETRON Dyar.

VIPSOPHOBETRON DENDERIA, new species.

Collar ocherous brown; thorax dark brown; fore wing very dark brown at the base, sharply limited outwardly from middle of costa to tornus, the edge of the dark area incurved centrally; on inner margin a semilunate area of leaden brown with black flecks in its upper edge; apex ocher-brown with a small dark spot before the tip. Hind wing and abdomen brown. Expanse, 24 mm.

Type.—Male, No. 14091, U.S.N.M., Sixola River, Costa Rica, March 14, 1909 (W. Schaus).

Genus PSEUDOVIPSANIA Dyar.

PSEUDOVIPSANIA MELANOIS, new species.

Collar and disk of thorax pinkish and gray; thorax and base of abdomen leaden gray; abdomen black, the anal tuft orange; fore wing long, produced, leaden black, the discal area subhyaline, in which the veins bordering the cell are thickened with black scales. Hind wing similar, the translucent area extending to the margin; hind wing small, produced-trigonal. Expanse, 28 mm.

Type.—Male, No. 14092, U.S.N.M., Tuis, Costa Rica, August, 1909 (W. Schaus).

Genus *DICHROMAPTERYX* Dyar.*DICHROMAPTERYX DIDYMA*, new species.

Dark lustrous brown; fore wing with a pale leaden line from middle of costa to tornus, beyond which the color is of a more lilaceous tint but not much lighter. Hind wing dark brown. Expanse, 21 mm.

Type.—Male, No. 14093, U.S.N.M., Carillo, Costa Rica, October, 1909 (W. Schaus).

Similar to *Dichromapteryx obscura* Dyar, but the serrations of the antennæ are longer.

Family ZYGÆNIDÆ.

Genus *GINGLA* Walker.*GINGLA MYRLA*, new species.

Entirely black, with a blue-green reflection. The wings are broad and squarely rounded, thinly scaled, semitranslucent. Expanse, 19 mm.

Type.—No. 13862, U.S.N.M., Mexico City, Mexico, July, 1910 (R. Müller).

GINGLA ASTORA, new species.

Fore wing black, but with a brown tint from the color of the under side; an ocher yellow ray just below costal edge from base to beyond middle; margin black. Hind wing bright ocher yellow, the margin narrowly black. Beneath both wings ocher yellow with black fringes. Body parts entirely black. Expanse, 13 mm.

Type.—No. 13863, U.S.N.M., Popocatepetl Park, Mexico, 8,000–10,000 feet, July, 1906 (W. Schaus).

Genus *ADSCITA* Retzius.*ADSCITA MORELIA*, new species.

Black with strong green reflection. Fore wing uniformly of this color. Hind wing hyaline in the middle, the veins and margins black, the black dull, without green luster above, but strongly green below, except on the hyaline part. Tongue reddish brown, contrasted in color between the small black palpi. Expanse, 25 mm.

Type.—No. 13864, U.S.N.M., Morelos, Mexico, 7,000 feet (W. Schaus).

Genus *HARRISINA* Packard.*HARRISINA AUCHENOCHRYSA*, new species.

Black with moderate bluish reflection. Head, except the front, collar, and anterior half of thorax orange color. Expanse, 24 mm.

Type.—No. 13865, U.S.N.M., Cordoba, Mexico, May 17, 1908 (F. Knab.)

HARRISINA TESSACANS, new species.

Fore wing blue-black; hind wing duller black, but with some blue luster. Beneath with blue luster. Collar broadly orange-yellow. Expanse, 28 mm.

Type.—Male, No. 14219, U.S.N.M., Tehuacan, Mexico, April, 1911 (R. Müller).

Genus *ACOLOITHUS* Clemens.*ACOLOITHUS ERYTHROZONA*, new species.

Black, the wings not very densely scaled and with very little metallic reflection; what is present is bluish. Abdomen crimson except the basal and terminal segments. Expanse, 20 mm.

Type.—No. 13866, U.S.N.M., Mexico City, Mexico, August, 1910 (R. Müller).

Genus *PSEUDOTALARA* Druce.*PSEUDOTALARA PSEUDOPHILE*, new species.

Wings dark leaden gray, the hind wings a little less metallic than the fore wings; an orange band on collar running around the head and staining its posterior portion. Expanse, 17 mm.

Type.—No. 13867, U.S.N.M., Oaxaca, Mexico (Schaus collection).

PSEUDOTALARA LATERALIS, new species.

Bright orange color. Costal edge of fore wing and outer margin narrowly black. Hind wing with a black border on margin, broadest at apex. Head black on vortex with a few orange scales in front; disk of thorax orange; legs black; abdomen orange on the sides, black dorsally and ventrally. Expanse, 26 mm.

Type.—No. 13868, U.S.N.M., Miantla, Mexico, November, 1910 (R. Müller).

Family CASTNIIDÆ.

Genus *CASTNIA* Fabricius.*CASTNIA THYSANETE*, new species.

Black; fore wing washed with whitish beyond cell and in lower part of subterminal space, the white irrorated with black and assuming a leaden tint on inner margin; a white oblique bar on costa at end of cell; two white subapical spots; outer line oblique, straight, from middle of inner margin to costa before apex, black, defined whitish within, lost apically in the region of the white spots; the line is followed by black lunules of the ground color above vein 1c, running into the black termen above. Hind wing with a red mesial bar and two outer rows of creamy white spots, the inner row small and dif-

fused, the outer row large and parallel to the margin, but with diffused edges. Expanse, 79 mm.

Type.—Female, No. 14031, U.S.N.M., Tehuacan, Mexico, June, 1910 (R. Müller).

Mr. Schaus has compared the specimen in London

Family PYRALIDÆ.

Subfamily PYRAUSTINÆ.

Genus OMPHISA Moore.

OMPHISA BRUNETTALIS, new species.

Reddish brown; fore wing with white semihyaline spaces as follows: A square spot at end on cell and small spot near its base; an outer row of squarish spots in two rows, separated by a slender line of the ground color, the inner spots partly confluent, the outer ones smaller and separate; the row is incurved below so that the spots at base of vein 2 touch the cell. Hind wing whitish; an ocher discal spot edged with brown; a double waved outer blackish line, the two lines of which it is composed touching on the veins so as to define spots of the ground color; termen beyond this line light brown. Expanse, 40–50 mm.

Cotypes.—Four males, one female, No. 14033, U.S.N.M., Zacualpan, Mexico, August, 1909 (R. Müller).

Genus POLYGRAMMODES Guenée.

POLYGRAMMODES HIRTALOIDALIS, new species.

Wings pale yellow; fore wing with a brown patch at the base, running broadly along inner margin nearly to tornus; inner line outwardly oblique, running into the brown shade below orbicular; orbicular yellow in a black ring; reniform quadrate, brown, edged with black; outer line brown, slender, waved, touching the brown shade at vein 2, then reentrant and forming a loop touching the reniform beneath; a black subapical patch below subcostal vein, excavate on its outer side and somewhat dentate within. Hind wing with a discal ringlet and a black bar from thence to inner margin, where it is surrounded by a brown cloud; a wavy mesial line, distinct only on its costal segment; a submarginal line, blotched costally, elsewhere faint. Expanse, 34 mm.

Type.—Female, No. 14034, U.S.N.M., Mexico City, Mexico, September, 1910.

POLYGRAMMODES MODESTALIS, new species.

Light brown, the abdomen with a double row of dorsal white spots. Fore wing with the veins and lines dark brown; cell a little lighter as also the interspaces between the outer and subterminal lines;

costa and fringe dark brown; inner line arcuate, dentate a little on the veins, far from base; outer line oblique, similar to the other; reniform and orbicular round, brown, fused to the edges of the cell; subterminal line dentate, connected with the outer line by a line between veins 2 and 5; a terminal row of pale yellowish marks. Hind wing whitish, tinged with brown, the veins brown; discal mark large, brown; median line straight, dentate; submarginal line somewhat dislocated on the veins, joined to the mesial line between veins 2 and 5 as on fore wing; terminal space red-brown; fringe dark, with basal and central darker lines. Expanse, 44 mm.

Type.—Female, No. 14035, U.S.N.M., Orizaba, Mexico, June, 1910 (R. Müller)

Genus *PHRYGANODES* Guenée.

PHRYGANODES LEUCOPHASMA, new species.

Tan-brown, with white subhyaline spaces; a speck near base of cell and larger one below; a round spot in end of cell; a pyriform one below it from which extend in the usual incurved course of the subterminal line five spots to costa, the three below small and dislocated by a blackish cloud, the two upper larger, quadrate and fused; all the spots more or less continuously edged with black; fringe blackish-shaded with a whitish spot at tornus. Hind wing with two spots touching at their angles, the one on inner margin running into the cell, the discal one farther out and running upward toward costa; fringe streaked with blackish; apex a little shaded with blackish. Expanse, 30 mm.

Cotypes.—Males, No. 14036, U.S.N.M., Sierra de Guerrero, Mexico, October, November, and December, 1910 (R. Müller).

PHRYGANODES ANCHORITALE, new species.

Umber brown, the median space of fore wing lighter, more yellowish brown; lines broad, brown-black, the inner curved, the outer scarcely irregular; a small orbicular of brown; reniform a bar. Hind wing with mesial line and discal dot not much darker than the ground color. Beneath the wings are lighter and more grayish; discal dots black on both wings, small; outer line dark, shaded, indistinct. Expanse, 24 mm.

Type.—Female, No. 14037, U.S.N.M., Misantla, Mexico, August, 1910 (R. Müller).

PHRYGANODES MOSTELLA, new species.

Smooth gray with an olivaceous tint; lines blackish, the inner bent down on its lower third; a lunate discal mark; outer line squarely projected outward in its middle third, the lower segment thickened and followed indistinctly by whitish. Hind wing with

whitish along costa, else colored as the fore wing; mesial line projected in the middle, the projected segment somewhat more distinctly broken into dots than on the fore wing. Costa at base in the male with a bladder-like swelling and a tuft of whitish hairs below. Expanse, 34 mm.

Type.—Male, No. 14038, U.S.N.M., Orizaba, Mexico, January, 1909 (R. Müller).

Mr. Schaus remarked upon this specimen that it is like *P. omphalobasis* Hampson, but with the lines more distinct.

Genus PILOCROCIS Lederer.

PILOCROCIS CAUDATELLA, new species.

Straw-color, shaded with brown except the median space on fore wing and base of hind wing; inner line blackish, curved; orbicular a dot; reniform an oval ringlet; outer line with its middle segment projected, with three rounded teeth, the lower segment oblique; a black cloud near middle of termen; a line at base of fringe. Hind wing with discal dot and mesial line similar to the outer line of fore wing; a line at base of fringe. Antennæ of the male with a tuft of black hair in the middle; abdomen with a terminal brush of light brown hairs; a black spot on fore tibia; a black dorsal line on second abdominal segment; a curved line on penultimate segment with double dorsal lines on the last. Expanse, 25 mm.

Type.—Male, No. 14039, U.S.N.M., Misantla, Mexico, June, 1910 (R. Müller).

Mr. Schaus kindly examined the specimen.

Genus PYRAUSTA Shrank.

PYRAUSTA DILECTICOLOR, new species.

Yellow and bronzy brown; fore wing with a central yellow mark composed of two elliptical spots, the inner nearly crossing the wing, the outer from vein 2 to costa, joined by a dash on median vein; slight indistinct spots in a line beyond the outer edge of each. Hind wing with the base yellow, limited by a mesial line with its middle segment projected and defined from the outer ground by a parallel row of yellow dots; a brown discal patch. Fringe indistinctly spotted with yellow on both wings. Termen of hind wing excavated at anal angle. Expanse, 22 mm.

Type.—Female, No. 14040, U.S.N.M., Misantla, Mexico, October, 1909 (R. Müller).

Genus DICHOGAMA Lederer.

DICHOGAMA COLOTHA, new species.

White; costa of fore wing narrowly black to the outer line; inner line straight, black, oblique from costa at base to inner third of inner

margin; mesial line parallel to it, from inner fourth of costa to middle of inner margin; an oblique parallel bar from costa at end of cell, sending out black streaks along veins 2 to 6 in a gray shade; outer line from costa at outer fourth, excurved nearly to termen, incurved to inner margin at mesial line; a vermillion red half band on termen from apex to vein 2, followed below by a curved gray shade; a row of terminal black dots in the red; fringe leaden gray. Hind wing white, semihyaline, with a dark gray terminal shade on upper half. Expanse, 28 mm.

Type.—Female, No. 14292, U.S.N.M., Tehuacan, Mexico, June, 1911 (R. Müller).

Genus *LYGROPIA* Lederer.

LYGROPIA SUBCOSTALIS, new species.

Dark brownish yellow, the wings shining, the hind pair a little paler; a black line along the costa of fore wings beneath; legs with the tibiæ and tarsi black; antennæ black with the tips white; third joint of palpi black. Expanse, 18 mm.

Type.—Male, No. 14208, U.S.N.M., Orizaba, Mexico, May, 1911 (R. Müller).

Genus *CLINIODES* Guenée.

CLINIODES NOMADALIS, new species.

Shining pale yellow; costa brown on basal two-thirds with expansion at middle and end of cell; a gray-brown shade along inner and outer margins, narrowing to apex; inner line curved, distinct only at the costal expansion; an erect blackish bar at middle of inner margin; outer line curved, finely crenulate, expanded and brown on costa, also expanded but black on inner margin. Hind wing translucent opalescent whitish. Expanse, 33 mm.

Type.—Male, No. 14041, U.S.N.M., Misantla, Mexico, April, 1911 (R. Müller).

Subfamily CRAMBINÆ.

Genus *CHILO* Zincken.

CHILO DILETANTELLUS, new species.

Straw yellow; fore wing with a dark-brown ray from base through the cell to termen, broadest in the middle; a silvery white shade below it; inner margin coarsely dusted with brown; fringe shining. Hind wing soiled whitish with pale gray apex. Expanse, 43 mm.

Type.—Female, No. 14042, U.S.N.M., Cuernavaca, Mexico, June, 1906 (W. Schaus).

CHILO DUOMITA, new species.

Straw yellow; fore wing shaded and dusted with brown except for an area on inner margin, which is terminated irregularly above by a faint brown line from base, that is curved down nearly to margin at basal third, then up to end of cell, and finally runs across the brown part to apex; a dark discal point; fringe dark. Hind wing whitish, silky, a little soiled along the veins. Expanse, 50 mm.

Type.—Female, No. 14043, U.S.N.M., Coatepec, Mexico, October, 1910 (R. Müller).

Subfamily PHYCITINÆ.

Genus SEMATONEURA Ragonot.

SEMATONEURA DENTICOSELLA, new species.

Fore wing gray on costal third, the rest red-brown; the colors not sharply defined but mingled on the middle of the wing in streaks and dashes; some blackish streaks, which in the position of the outer line are edged with gray, forming long digitate dentations. Hind wing translucent, opalescent, becoming gray at apex and fringe. Expanse, 40 mm.

Cotypes.—Females, No. 14044, U.S.N.M., Orizaba, Mexico, October, 1908; Misantla, Mexico, August, 1910 (R. Müller).

Genus ANCYLOSTOMIA Ragonot.

ANCYLOSTOMIA ROSEITINCTELLA, new species.

Straw yellow; a deep rosy shade mixed with gray from inner third of costa to apex, broadest in the middle; a similar shade on inner margin from near base to termen, widening outwardly; these two leave a broad ray of the yellow ground between them in which rests the round discal dot. Hind wing translucent, opalescent, gray at apex and outer margin, but the fringe silky white. Expanse, 31 mm.

Cotypes.—Females, No. 14045, U.S.N.M., Cuernavaca, Mexico, July, 1906 (W. Schaus); July, 1909 (R. Müller).

Family COSSIDÆ.

Genus ACOSSUS Dyar.

ACOSSUS LEUCEGCHYTUS, new species.

Gray, the basal half of fore wing shaded with black, the outer half with white shadings, most distinct in a large reniform area and above tornus; reticulations fine, black, with larger coarse heavy ones beyond the middle, forming a large X-mark on the disk, its outer limbs forked toward apex and tornus respectively. Hind wing grayish, reticulated beneath, which shows by transparency. Thorax and abdomen dark and shaded with blackish. Expanse, 47 mm.

Type.—Male, No. 14209, U.S.N.M., Mina San Rafael, San Luis Potosi, Mexico, May, 1911 (R. Müller).

Genus GIVIRA Walker.

GIVIRA SANDELPHON, new species.

Body dark silky gray without markings. Base of fore wing blackish gray, quadrately reticulated with paler; middle third of wing lighter gray, the cell filled with pale luteous; following this across middle of wing a blackish gray slightly oblique band, very slightly reticulated; terminal third of wing lilacine gray, inclosing an outer narrow, broken, and somewhat reticulated line; across the apex a black band, with reticulated projections and a whitish inner bordering dilution; a small dark mark with reticular projection on tornus. Hind wing blackish gray, with a few strigæ and traces of reticulations, showing especially as markings on the termen. Beneath much lighter, the dark markings of fore wing repeated, the hind wing pale gray with the broken reticulations and strigæ more distinct. Expanse, 34 mm.

Type.—Male, No. 14236, U.S.N.M., Misantla, Mexico, March, 1911 (R. Müller).

DESCRIPTION OF A NEW SPECIES OF THE ISOPOD GENUS CASSIDINIDEA FROM MEXICO.

By HARRIET RICHARDSON,

Collaborator, Division of Marine Invertebrates, United States National Museum.

Two specimens, representing a new species of *Cassidinidea*, were collected by Dr. Edward Palmer in 1910, at Maron Lagoon, Madre, Mexico. They were found in oysters taken from salt water.

Family SPHÆROMIDÆ.

CASSIDINIDEA TUBERCULATA, new species.

Body ovate, twice as long as wide, $2\frac{1}{2}$ mm. by 5 mm. Surface smooth except the abdomen, which is covered irregularly with small tubercles. Color white, with numerous arborescent markings of black.

Head wider than long, with the anterior margin widely rounded and produced in a small median point. The eyes are small, round, composite, and placed in the post-lateral angles. The first antennæ have the first and third articles of the peduncle about equal in length, the second somewhat shorter than either of the others. The flagellum is composed of four articles, the last being tipped with hairs. The first antennæ extend just a little beyond the posterior margin of the head. The second antennæ have a flagellum composed of eight articles, the first being twice as long as the second and the last three minute. The second antennæ extend to the middle of the first thoracic segment.

FIG. 1.—CASSIDINIDEA TUBERCULATA. $\times 12$.

The first segment of the thorax is a little longer than the following six, which are subequal. The lateral margins of the segments are straight. The epimera are not distinct on any of the segments.

The abdomen is composed of two segments, the first of which is short and has suture lines indicating other partly coalesced segments.

The terminal segment is triangular with apex rounded. The dorsal surface of both of these segments is covered with small tubercles. The inner, immovable branch of the uropoda extends to the tip of the terminal abdominal segment; it tapers to a rounded extremity.

The outer branch is one-third the length of the inner branch and is posteriorly rounded. Both branches are furnished with hairs.



FIG. 2.—CAS-
SIDINIDEA TU-
BERCULATA.
MAXILLIPED.
× 77½.

Two specimens, both females, were collected by Dr. Edward Palmer in 1910, at Maron Lagoon, Madre, Mexico. They were found in oysters in salt water.

The types are in the United States National Museum, Cat. No. 43193.

The two other described species of this genus from the Atlantic coast of North America are *Cassidinidea ovalis* (Say) and *Cassidinidea*

lunifrons (Richardson) from both of which the present species differs in the more rounded apex of the terminal abdominal segment, and in the presence of tubercles on the abdomen. It differs further from *C. lunifrons* in the shape of the head and in the shape and position of the outer branch of the uropoda.

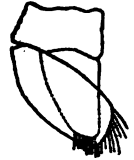


FIG. 3.—CAS-
SIDINIDEA TU-
BERCULATA.
THIRD PLEO-
POD. × 41.

CENSERS AND INCENSE OF MEXICO AND CENTRAL AMERICA.

By WALTER HOUGH,

Curator of Ethnology, United States National Museum.

INTRODUCTION.

During the course of investigation on the utilization of fire the attention of the writer was drawn to several aboriginal American incense burners in the collection of the United States National Museum, and as these objects are rare and have never been discussed under one title, it was thought desirable to describe them, together with such American material as was procurable. Père Lafitau remarks that "the altars of primitive times were not different from the ordinary house fire" and compares the portable altar or pyranon of the Greeks with the calumet of the Indians.¹ The uncivilized tribes of America are still in the rudiments of the incense cult, their practices being confined mainly to oblations to fire, in the nature of individual acts or occasionally appearing as a single rite in ceremonies. For this reason the cult apparatus is very simple, like the pipe or analogous smoke-producing inventions, or the simple fire-place.

This paper therefore concerns itself with the apparatus found principally in Mexico and Central America, where several types occur, falling under the following classification, which also may be found applicable to the general subject.

CLASSIFICATION OF CENSERS.

I. COMMUNAL OR GENERAL.

1. STATIONARY.

(a) Tribal, society, and family fireplaces, fire boxes, and fire altars.

Several ideas are involved in this division, such as preservation and renewal of fire for the health and well-being of the larger and smaller social units or religious organizations, as well as the beings themselves; sacrifice to fire by various oblations, with the idea of

¹ *Moeurs des sauvages américains*, vol. 1, pp. 159 and 167, Paris, 1724.

feeding, attracting, appeasing, or beseeching the unseen beings. These and other unformulated acts associated with fire have been observed throughout the world among peoples of different degrees of culture.

- (b) Great stone braziers, generally of hourglass shape, erected on masonry bases before temples or shrines. (Mexico.)

Stone basins borne by animal or human figures placed at shrines or sacred locations. (Chiapas, Yucatan, Mexico; Costa Rica; Honduras; and Guatemala.)

Circular stones on short pediments or caryatides; "altars" of shrines, in temples. (Yucatan and Honduras.)

- (c) Large pottery vessels of hourglass shape ornamented with masks, bands, knots, knobs, and spurs, and painted in colors. Placed as the stone braziers before temples or at shrines. Essentially Nahuatl. (Nahuatl Mexico; Guatemala; Costa Rica.)

II. SPECIAL.

1. PORTABLE.

- (a) Braziers of small size used in dwellings. Of various forms. (Mexico.)
- (b) Tripod censers consisting of a bowl mounted on three splayed feet preserving in general the hourglass form. Set on the ground. (Southern Mexico; Costa Rica.)
- (c) Bowl censers, bearing a mask and other rudiments of human or animal forms, as in the monolithic braziers. (See I, b) (Chiapas and Yucatan, Mexico; Guatemala; Costa Rica.)

2. GESTURE CENSERS.

- (a) Flaring bowl with rudimentary handle and spurs representing other feet of tripod. (Oaxaca, Mexico.)
- (b) Openwork pottery tripod vessel, one leg of which is extended to form a handle. Rattle feet. (Zapotec area, southern Mexico.)
- (c) Spoon with truncated handle. Ventilation holes in bowl. Rude. (Zapotec area, southern Mexico.)
Small spoons with conventional animal handle. (Southern Mexico; Costa Rica.)
- (d) Incense ladle consisting of a bowl ventilated with openwork pattern and having a long, hollow handle containing rattles and terminating in a serpent or other head. Nahuatl form. (Central Mexico.)
- (e) Tubular pipes for incensing the esoteric beings and cardinal points. Pipes in general cult uses. (Ancient and modern Pueblos and other Indians, also northern Mexico and other Mexican localities.)
- (f) Cigarettes. (Mexico and ancient Pueblos.)

3. SWINGING CENSERS.

(a) Censers introduced from Europe. Accultural. (Chiapas specimen.)

I. COMMUNAL OR GENERAL.

1. STATIONARY.

(b) The great masonry braziers located before shrines about the *teocallis*, and at various other sacrificial spots where perpetual fires were maintained and offerings consumed were not strictly incense burners, though so treated at times.¹ Usually upon them living victims were immolated and it was the custom to throw into the brazier fire the ashes and unconsumed incense from the portable censers together with the paraphernalia and offerings which had been employed in ceremonies. The brazier was the source from which live coals were taken to ignite the incense in the hand censers.

The brazier appears to be a perpetuation of the primitive communal fire, and the Nahuatl name by which such braziers were called, *ilexicli*, "fire navel," connotes an idea relating to birth and the underworld like the Hopi *sipapu*. In describing the ceremony of kindling new fire on the Hill of the Star in the valley of Mexico, Sahagun mentions the brazier: "The inhabitants of Mexico, having arrived home with their torches lighted, carried them at once to the temple of Uitzilopochtli and proceeded to place the fire, with much copal incense, on the great brazier of masonry elevated before the idol."² He also states that "they burned much night and day in the courts of the temples on the elevated fireplaces which they had made for that purpose."³

Again he speaks (p. 101) of a round hearth set in the midst of the court where it was elevated two spans above the surface and to which celebrants carried for deposit the ashes and coals from the censers.

Another form of brazier, described briefly by Sahagun, was a stone basin encased in pine wood in which the flimsy ornaments and the *mantas* which had been worn by celebrants were burnt. Its name, *quauxicalli*, is interpreted "wood vase"; it was situated at the foot of the *teocalli*, while the great brazier in which victims were burned stood on the apex platform.

There is in the United States National Museum a cylindrical block of hard eruptive rock having a rectangular shallow cavity 9 inches

¹ It is said that there were 600 braziers of stone, some round and some square, about the great temple compound of Mexico. Bancroft, *Native Races*, vol. 2, p. 584, New York, 1875, citing the Motolina *Historia de los Indios de la Nueva España* in Icazbalceta, *Col. de Doc.*, vol. 1, p. 65. (Since published by Pimental, Mexico, 1903.) Bancroft, *Native Races*, vol. 2, p. 567, citing Veytia, *Hist. Antigua de Mejico*, vol. 3, p. 310, states that the streets of Mexico were lighted with braziers tended by the patrol.

² *Historia universal de la Nueva España*, by Bernardino de Sahagun, translated by Jourdanet et Stimon. G. Masson, Paris, 1880, p. 491.

³ Sahagun, work cited, p. 186.

square cut in the upper surface which shows erosion as by fire, and it is thought that the specimen is a brazier such as Sahagun describes. A glyph resembling a conch shell is repeated around the periphery, between the upper and lower bordering bands, which are decorated with a textile design representing a braided band. The brazier is from Mexico and was collected by W. W. Blake. Diameter, 15½ inches; height, 10 inches. (Acc. 17619, Orig. No. 126.) (Pl. 3 a.)

A perfect example of the ancient stone brazier (fig. 1) was brought to light a few years ago during the excavations by the Mexican Government at Teotihuacan.¹ It was found on the upper horizontal plane of the central three-story temple at the base of the great Pyramid of the Sun and consists of a monolithic sculpture of hourglass shape set on a base of three courses of squared stone. With it were found two sculptured tablets and two dados. The brazier bears around the middle a band terminating on opposite sides in a complicated knot which hangs down to the base, the lappets below the tie corresponding to the four ends of the band.

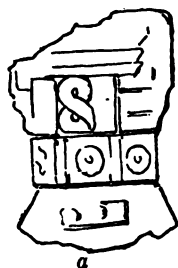


FIG. 1.—MONOLITHIC BRAZIER, TEOTIHUACAN. (a) AND (b), DESIGNS ON SCULPTURED KNOTS.

The knots bear signs consisting of disks, bars, and a figure 8, like the twisted bread offering made to Ciuapipiltin,² the signs differing slightly on the two knots. (Fig. 1, a, b.) The tablets and dados are stated to bear a like symbolism. The form of the brazier described appears to be quite constant in the Nahuatl area and was carried wherever that influence went. The conception would seem to be that of the human form, which is more apparent in the pottery vessels of this class, to be noted later, offering more latitude to the sculptor than hard stone.

A specimen in form of an hourglass, of greenstone, having a band of cords around the middle and animal heads projecting on opposite

¹ Batres, Teotihuacan. Mexico, 1906, p. 25.

² Sahagun, work cited, p. 20.

sides has the appearance of the Nahuatl type of brazier and may be assigned to that class. It comes from Costa Rica and was collected by C. N. Riotte in 1866. Diameter, $10\frac{1}{4}$ inches; height, 11 inches. (Cat. No. 2347, U.S.N.M.) (Fig. 2.)

The stone basins borne by human or animal figures are mainly of the brazier class and represent this form among non-Nahuatl peoples. They are generally found south of the Nahuatl area and extend to Ecuador. The best known figures of this class are the specimen from Santa Lucia, Cozumalhuapa, Guatemala (pl. 3 *b*), in the Royal Museum of Berlin (see Catalogue Guide for 1904; Georg Reimer, Berlin), and the stone basin near Cuernavaca, Mexico.

A large monolithic sculpture in basalt representing two clasped human beings, the recumbent figure bearing a basin of ovate outline over the belly, exists in the United States National Museum. It is of heavy black basalt and comes from Costa Rica. (Pl. 3 *c*.¹) The relation of this sculpture to several recumbent figures found in Mexico, the most celebrated being known as Chac-Mool, and others questionably spoken of as pulque gods, is quite close, and taken in connection with the fire navel idea (p. 111), the making of new fire on the belly of a victim, and the beliefs concerning fire, generation, and life, presents an interesting suggestion. In some cases basins held in the hands of stone figures have evidently been used for the burning of incense. In one of these specimens, about 3 feet high, found at Copan, Honduras, the basin is held up on a level with the chin of the idol. (Pl. 4.) This form appears to be related developmentally to the pottery bowl with the head on one side; it is discussed by Dr. Eduard Seler in Bulletin 28, Bureau of American Ethnology, Washington, 1904, pages 84-85.

Dupaix figures an image of granite 12 inches in height representing a seated man with crossed legs and arms from Zachila, 10 to 12 miles south of Oaxaca. The sash about the loins of this figure has the knot at the back. Another from this locality has a hollow in the top of

FIG. 2.—BRAZIER OF HOURGLASS FORM,
COSTA RICA. COLLECTED BY C. N.
RIOTTE.

¹ Brazier. Basaltic rock, sculptured in the form of two clasped figures, the recumbent one bearing a basin held in the hands. The breasts hang over the edge of the basin. The head of this figure has been broken away, and the whole surface of the object is much worn by weather. It measures 33 inches long, 18 inches high, and 19 inches wide at the greatest projections. Costa Rica. Collector unknown. (Cat. No. 179120, U.S.N.M.)

the head and seems, like many others from this region, to be a vase or torch bearer.¹

At Teotihuacan braziers were recently found representing a human figure bending forward with hands on the ground and bearing a basin on the back. The specimen shown is in the Museo Nacional de México. The material is andesite, of light color. (Pl. 4.)

The George G. Heye expedition has recently discovered in Ecuador an old form of monolithic censer consisting of a seated figure with hands raised bearing a bowl in which there still remains half-burned incense.

The "sacrificial stone" of Mexico, which has a cavity in the middle from which leads a gutter passing over the flat surface and down the side, obviously worked out since the completion of the relief decoration, appears to have had a secondary use as a brazier. The function of the trough would be to facilitate drawing out the ashes, which, as Sahagun states, were carefully preserved for deposit in a place set apart for the purpose, and it is obvious that the thorough removal of every particle of the ashes could not well be accomplished over the rough, sculptured surface of the stone. The following references to Sahagun describe the care with which ashes were preserved:

When they had finished the incensing they went to deposit the ashes in a round hearth called *tlaxicli* (fire navel), which was placed in the midst of the court where it was elevated two spans above the surface.²

This having been done, the ashes and the objects which had been employed in the service of the gods were carried to the oratories called *ayauhcalco* (in the house of fogs or vapors).

(These oratories, also called *ayauhcalli*, were ordinarily placed on the banks of water courses.³)

When the aurora appeared and when one could see the morning star they interred the ashes belonging to the offering, likewise the flowers, the reeds where they burnt the perfumes, in the belief that these objects should not be seen by anyone addicted to vices as would be a man living in concubinage, an adulterer, a gambler or a drunkard; for they held all that kind as blemished and they forbid that they should see the interring of the ashes of the sacrifice. After they had put them in the ground, they began to sing and dance to the sound of the tambour and the *teponastli*.⁴

A number of altars have been discovered in Mexico and Central America, especially by the field parties sent out by the Peabody Museum. These are apparently not fire altars or censers, but the altar block of Stela M in the hieroglyphic stairway of Copan⁵ incorporated a figure (snake) as in the animal and mask vases like those of the Lacandones, for example,⁶ figured by Maler and repro-

¹ Dupax in Kingsborough, *Mexican Antiquities*, vol. 4, pl. 43.

² Sahagun, work cited, p. 101.

³ Translator's note, Sahagun, work cited, p. 74.

⁴ Sahagun, work cited, p. 570.

⁵ Mem. Peabody Mus., vol. 1, No. 6, pl. 16.

⁶ Idem, vol. 2, No. 1, p. 28.

duced in Tozzer's report. Stephens also found a copal altar in a room in the ruins of Tuloom, east coast of Yucatan.¹

(c) Another class of stationary braziers are the large pottery vases of hourglass form which have been found in greater number in and about the City of Mexico than elsewhere. On account of their size and decoration, they are remarkable examples of the potter's art, while their form and decorative treatment seem to connect them closely with the genius of Nahuatl culture, whose spread by conquest has carried them far into Central America. This form may be regarded as the most characteristic of the middle American censer-braziers. Though not definitely mentioned by the early chroniclers, who speak usually of stone braziers when the material is given, they were surely in use in Mexico at the time of the conquest, those in the Museo Nacional de México,² being the only form of brazier which has been recovered from the ruins of the ancient city.

One of the most striking exhibits of the great National Museum of Mexico are the enormous pottery vases, two of which were found in the ruins of the temple of the *curato* at Ixtapalapa, where was celebrated the cyclical feast of the kindling of the new fire, and one from Santiago Tlaltelolco. The vases each bears a human figure in high relief painted in colors, the face framed in the gaping mouth of a monster, suggesting a mask.

The specimen (pl. 5a) from Ixtapalapa has an hourglass body, decorated with the figure of the god of fire (?), whose face appears somewhat in side view, who wears a girdle of human hands, has a circular sign like that of Chac-Mool (gorget?) in his middle, side loops or knots, and skirt hanging down slantingly on either side. The upper rim of the vase is decorated with hanging spikes. Another specimen from the same locality is similar to the one just described, but the legs and feet of the figure (pl. 5b) are better preserved. The third specimen, from Tlaltelolco, is almost denuded, giving one a view of the form of the vase. (Pl. 5c.) A magnificent example, locality unknown, of rather slender form and in excellent preservation, shows excellently the conventionalized human figure wearing a crownlike headdress and with expanded wings springing from the sides of the body. (Pl. 6b.) The cinerary vase from Tlaltelolco (pl. 6a) suggests in form the pottery brazier shown in plate 5c and is a remarkable specimen in modeling and color. This vase was described by Brantz Mayer,³ who says that it is 22 inches high, 15½ inches in diameter, and that when found it had a lid and was filled with human skulls.

¹ Yucatan, vol. 2, pp. 387-408.

² Catálogo de Departamento de Arqueología del Museo Nacional. Jesus Galindo y Villa. México, 1897.

³ México, vol. 2, 1863, p. 274.

These great pottery braziers are monuments to the modeler's skill in producing a forceful work from crude material, and the final painting raises these objects immediately to a high plane of esthetic quality.

Dr. Eduard Seler,¹ in his account of the finds in the Calle de las Escalerillas, City of Mexico, some years ago, remarks:

About 20 meters to the east of the first skull altar, or, as we now know, the first Tezcatlipoca stone seat, were found two pottery vases three-quarters of a meter in height, presumably fire vases. They have on the lower border a decoration of knobs, and in the middle a band which in front is bound into a large loop. A rather large hole is formed in the walls of the vase from side to side at the level of the band, possibly for the passage of a pole by means of which the heavy vessel was transported. (Pl. 7 a, b.)

It will be interesting to determine conclusively whether these braziers were transported by means of a pole, as suggested by the curious orifice passing through the body of the vase. If this opening is not connected with the ventilation of the fire, the brazier probably was used in some rite which required its transportation from one place to another not far distant. The two Ixtapalapa braziers show this feature, but apparently the holes are too far off the center to admit of balance on a pole. (Pl. 5 a, b.) The Tlaltelolco specimen (pl. 5 c) appears to have no such construction. The brazier figured by Dr. Seler² from Copan, Honduras, is perforated in a similar manner. (Fig. 3.)

FIG. 3.—BRAZIER OF POTTERY, COPAN, HONDURAS.

In describing a great censer urn from the cave of Quen Santo-Chacula, district of Nenton, Department of Huehuetenango, Guatemala, Dr. Seler records that "in the depths of one of these caverns we found a kind of altar and walls which formed a chapel. We also found the idols in place and large urns, the openwork walls of which represent the features of a demon having large eyes, *colmières* springing from the mouth, and the nose and chin bristling with spines. One can imagine the effect this visage of the devil would produce when it was illuminated by the fire on the interior of the urn."³ (Fig. 4.)

Enough examples of the hourglass-shape censer-braziers have been recovered to enable one to trace in their form and embellishment certain motives which remain in the conventionalized specimens found at the three-story temple at the base of the Pyramid of the Sun at Teotihuacan, those of the Calle de las Escalerillas in the City of

¹ Seler, *Ges. Abh. sur Amer. Sprach u. Alterthumskunde*, vol. 2, Berlin, 1904, p. 883.

² *Idem*, vol. 3, p. 679.

³ *Idem*, vol. 2, p. 225.

Mexico, and those showing more realism and complexity of ornament from Tlaltelolco.

It appears that in many cases masks, heads, or other members of animate beings as so-called decorative elements are really vestigial and refer back to vessels of realistic animal form, but ideas of such forms may be taken by the artist at any phase of design mutation from models to mere traces, and even to surface painting, which itself may undergo both progressive and retrogressive fluctuations at different periods. There is difficulty in placing the original forms and building the series. Thus the hourglass-shape brazier appears from vestiges to have been an animal form, probably human, and could have arisen from the crouched figure with bowl on back, examples of which have been found in various localities, or readily from the human being in seated pose. (Pl. 8 *a*.) Many archeological forms refer back to the human motive, as the sculptured ax and the small jade and other stones tablets of Mexico and Central America, whose meaning is made clear by the aid of certain decorative vestiges which they preserve. The most noticeable vestige on the hourglass brazier is the sash, seen on the Copan and Santa Lucia Cozumalhuapa specimens (pl. 4 and pl. 8 *a*), and conventionalized in the Teotihuacan and Escalerillas braziers, but with pendants of corn and fruits on the Tlaltelolco specimens. The elaborate knots and the lappets are very characteristic and are made to bear symbolic meaning, in this respect resembling the expressive knot systems of Japan, and perhaps the evanescent cord figures of various peoples. The same idea obtains in the Pueblo region of the southwestern United States, where sacred incense cigarettes of reed joints are bound with cotton cords, the ends hanging free and the knot or other portion of the cord frequently securing shell beads of discoidal or pendent form. (See fig. 10 *a-e*.) Sometimes a small woven cotton sash is secured around the cane joint. In the same category are the pahos of the Pueblos,¹ which represent the human form and are supplied with the wrappings or cinctures under discussion.

Other vestiges represented by knobs or spurs, the former around the rim and foot, and the latter, usually two, on opposite sides near the base, are not so clear, but may be referred to costume and parts of the body.

Whether the hourglass-shaped pottery braziers may have been used to deposit the remains of high priests, or other important personages,

FIG. 4.—BRAZIER OR CENSER URN, GUATEMALA.

¹ Solberg, Über die Pahos der Hopi, Archiv für Anthropologie, vol. 4, 1906, pp. 48-74.

appears to be a matter worthy of inquiry. The relationship in form between the braziers and the mortuary vases and their general agreement in decoration show at least that they have some concept in common.

Sahagun¹ states that the Mexicans put the incinerated bones of the nobles in an urn, with a chalchiutl, and buried them in a room of the house and every day they placed offerings on the sepulcher. Also: "They burnt the belongings of the dead because they pretended that these things then went to the land of the dead."

According to Brantz Mayer, the Tlaltelolco vases contained skulls when found, and if only this portion of the body was inurned, may not the skulls be those of sacrifices placed in a brazier for interment?

The cinerary urns of Tlacolula were for burial of priests. Chavero² figures one of these, a seated being with hands on the knees, an elaborate girdle, ear plugs, and modified animal headdress showing a row of teeth. Breath signs also depend from the mouth. It is probable, and Seler³ agrees with me, that the braziers were sometimes used as mortuary urns for the burial of a cacique.

II. CENSERS FOR SPECIAL USE.

1. PORTABLE.

(a) The solidarity and pervasiveness of the aboriginal religion of Mexico is strikingly shown from the observations of the chroniclers, who state that the people were required to reenact in their houses, in abridged form, ceremonies following those held in the central religious edifices, and from such glimpses one may gather an inkling of the tedious rites of the domestic cult. Not even among the Pueblos, where all activities are regulated by or tinged with the system of religious observance, has such a binding power been displayed as in Mexico, where each house was a temple in miniature.⁴

Thus the domestic cult required sufficiently elaborate paraphernalia and apparatus to comply with the formulated observances prescribed by priestly law and applicable to the innumerable ceremonies of the religious calendar as well as to classes of persons, as the merchants, or to fraternities. Since the common act of all observance was the burning of incense, the domestic censer was a vessel whose use was almost universal.

It is unfortunate that no description by Sahagun, or other writers, reveals the form of the domestic brazier-censer of the Nahuas, but

⁴ Work cited, p. 224.

⁵ Mexico, p. 600.

⁶ Letter of April 13, 1911.

⁷ "Las Casas tells us that when the Guatemalans built a new house they were careful to dedicate an apartment to the worship of the household gods; there they burned incense and offered domestic sacrifices upon an altar erected for the purpose." Bancroft, *Native Races*, vol. 2, p. 786. Las Casas *Hist. Apologetica* M. S. Cap., 124.

as none of the utensils of pottery recovered shows a definite class referable to braziers, it appears likely that they were not of fixed form, any suitable vessel being employed.¹

Possibly in the practice of the domestic cult the forms of the temple apparatus were copied, and the hand censer, to be described later, as well as a small hourglass-shape brazier may have been used to some extent, though as a rule in all primitive religions most of the cult apparatus is esoteric and belongs to the fane and priesthood, not being seen by the uninitiated except on occasions of public ceremony.

A small terra-cotta brazier-censer from excavations in the Calle de las Escalerillas, City of Mexico, and which may have been of this class, is shown (pl. 8 *b*), and another from the pool of Chapultepec, near the city, shows a much conventionalized form (pl. 8 *c*).

Another consideration which bears on the effectiveness and to some extent the form of the censer is the ventilation required for the draft, as in a stove. The Mexicans had properly solved this problem by making openings, ornamental or otherwise, in the walls or the bottom of the incense vessels. Gum-resins, such as copal, do not burn readily, and it was customary to throw these substances in the form of powder or small pellets upon live coals from the great permanent brazier fires or from the domestic hearth, which was regarded sacred not only by the Mexicans, but by all peoples below the plane of enlightenment.

(*b*) *Tripods*.—In the non-Nahuatl portions of Mexico, however, generally south and east of the Nahuatl area, the portable censer is more commonly known, both from survivals and from the ancient examples which have been recovered from the ruins. Here the form is generally a tripod vessel, the feet hollow, modeled in a great variety of grotesque shapes, supplied with rattles, or solid and plain.

Doctor Plancarte found in the Matlaltzinca (Pirinda) area in the Valley of Mexico a specimen with three legs and having perforations of triangular and circular shape in the bottom. This authority says that the censer appears in his catalogue as a utensil of transition between the temple and the hearth, but it may belong properly to the cult, though such were used in the houses “para sahumar á los recién llegados y viajeros ó á las personas principales,”² to fumigate those recently arrived and wayfarers, or important persons.

Some Costa Rican censers have also lids, as in the Japanese *koro* and the Chinese allied form, and are remarkable examples of the potter's craft, an illustration of which, as well as one of the tripod class from Guatemala, have been kindly furnished by Dr. Walter Lehmann. (Pl. 8 *d* and pl. 9 *a*.)

¹ See Seler, work cited, vol. 2, 1904, p. 846, fig. 42, for forms found in the Calle de las Escalerillas, Mexico.

² Catálogo de la Colección del Señor Presbítero Don Francisco Plancarte, formada, con la colaboración del Dueño, por el Director del Museo Nacional de México. México, 1892. Exposición Histórico-Americana de Madrid, Para 1892. Sección de México.

The writer purchased in Oaxaca in 1899 a tripod incense burner of terra cotta, the rim decorated with a pair of masked human figures with upraised hands, a pair of birds, two flowers, and two U-shaped figures, probably snakes. The figures on the inner and outer rim and bottom of the bowl are painted rudely with white, black, and a blue resembling ultramarine. The figure in the bottom is evidently a sun symbol. I was informed by the dealer that this vessel was used by the Indians for burning copal and that the figures were "santos" of the Indians. Diameter, 7 inches; height to rim, 7 inches; to headdress of figure, 9½ inches. (Cat. No. 204692, U.S.N.M.) (Pl. 9 b.¹)

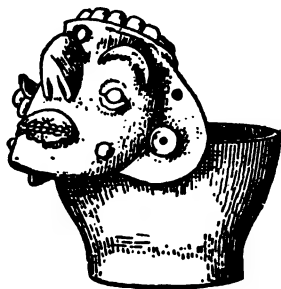


FIG. 5.—BOWL CENSER, LACANDONES, CHIAPAS, MEXICO.

(c) *Bowls*.—The Lacandonones of Chiapas, Mexico, observe a complicated incense rite yearly, when new incense burners are made and consecrated to the gods.² The censers are of homely vase or bowl form, painted black, white, and red with native colors, have a mask projecting like a bowsprit from the edge, and are provided with holes to insure ventilation. (Fig. 5.) It is customary to place in the open mouth of the mask offerings of food and drink and to burn nodules of copal in the vessel.³ The copal nodules are formed and stuck to a board having a handle at one side, and they are symbolically male and female, resembling in form the nodules of copal found in excavating the ancient sites of Yucatan, and reminding one of the joss sticks and pastilles of the Orient. (Fig. 6.) In the censer are placed jade figures representing the gods of the Lacandonones, and over them the copal is burnt. Palm leaves waved in the smoke are thought efficacious in driving away disease. The ceremony and the ceremonial use of the Lacandonones censer is a remarkable example of the survival of an ancient custom, and throws light on much that was unknown of the cult practices of this region.



FIG. 6.—COPAL NODULES, LACANDONES, CHIAPAS, MEXICO.

¹ For discussion of the headdress of an image on a Oaxaca censer, see Seler in Bulletin 28, Bureau of American Ethnology, 1904, pl. 35.

² Tzotzer, A comparative study of the Mayas and Lacandonones, Publ. Arch. Inst. America, New York, 1907, p. 107.

Maier, Mem. Peabody Mus., vol. 2, No. 1, p. 28.

Seler, work cited, 1908, vol. 3, pp. 585-589.

³ Stephens states that incense was burnt on the stone projecting from the mouth of a gigantic mask, the "Cara Gigantesca," at Izamal, Yucatan (Stephens, Yucatan, vol. 2, pp. 234-236), suggesting the food offerings in the mouth of the mask on the Lacandonones brasiers.

The Guatemalan portable incensarios are frequently spinose bowls with a head on one side. They all bear evidence of burning resin, are of crude, coarse clay, and some specimens have lids.¹

The censer has not survived among the Mayas as it has among the less modified Lacandonese; but L. H. Aymé sent to the National Museum from Merida, Yucatan, an incense burner of pottery of gray, coarse paste, washed brown on the interior and red on the exterior, and having the form of an incurved bowl mounted on a foot, and two rows of holes punched through the body to insure ventilation. (Fig. 7.) In the bottom of the bowl is a dab of the red paint with which the exterior is washed. (Compare Oaxaca censer, pl. 9 *b*.) This appears to be a vessel for burning incense in the house. (Cat. No. 73885, U.S.N.M., original No. 17.) Diameter, $4\frac{1}{2}$ inches; height, 4 inches.

2. GESTURE CENSERS.

The third class of censers comprises those held in the hand and used for wafting incense in a certain direction or toward any object to be incensed. It would seem that the requirement for worship toward the cardinal points has given rise to the hand censer, which in its most developed form resembles a shallow dipper with a long handle. There are specimens which may show a development of this form from a bowl or tripod censer, as suggested by:

FIG. 7.—VASE CENSER (MODERN), MERIDA, YUCATAN. COLLECTED BY L. H. AYMÉ.

(a) A specimen from Oaxaca, in form of a flaring bowl of brown unpolished ware having a projection from one side and a starlike handle with four prongs, appears to be a censer and to stand morphologically between the bowls and hand censers. It was collected by E. O. Matthews, and is $3\frac{1}{2}$ inches in diameter and $2\frac{1}{2}$ inches high. (Cat. No. 215137, U.S.N.M.) (Pl. 10 *a*.)

(b) Openwork pottery tripod vessel, one leg of which is extended to form a handle. This type is usually of extremely good art, and consists of a cup-shaped bowl pierced with beautifully executed openwork resting on two round feet supplied with rattles, the curved handle terminating in a flexed arm, which forms the handle and third foot. The specimen is from Oaxaca.² (Collected by L. H.

¹ See Hough, in Report of the Madrid Commission, 1892, Washington, 1895, p. 354.

Seler, work cited, 1908, vol. 3, p. 625, figures a spinose vessel of this construction.

² Rattle-foot censer of brown clay with design perforated and outlined with scratched lines and having bones on opposite sides. The end of the handle is modeled in the form of a flexed arm, the hand clasping the cylinder. The feet and handle are set in on stubs. The triangular ventilating orifices forming the openwork design have been punched out with a tool which leaves the edges slightly rough. Length, 8 inches; height, 4 inches; diameter, $3\frac{1}{2}$ inches.

Aymé. Cat. No. 131452, U.S.N.M.) (Pl. 10 *b.*) A number of similar censers have been found.

(*c*) Among the Lacandones of Chiapas, according to Tozzer, the ladle incensario occurs, but plays an unimportant part in the rites and is used only in the ceremony when the new *braseros* are installed. It consists of a dipperlike vessel with a head on the side next the handle, and is called *akna*, "the mother." Tozzer discusses this type of incensario¹ and says that the handle terminates in a hand in which offerings of food are made, while incensarios of the older culture had serpent heads. A handle of an incensario from Honduras is figured in plate 19 of Tozzer's work. Seler² figures specimens from Coban in the collections of Sarg, Sapper, and Dieseldorf, in the Museum für Völkerkunde, Berlin, that appear to be incense spoon handles. They are of animal forms, are short, and some of them have a foot; and, while no vessels to which they were attached have been found, it is probable that the identification by Seler is correct.

From the Zapotec area, Oaxaca, numerous examples have been found of a crude ladle of coarse, dark-gray pottery, the bowl of which has a flat bottom with six or seven holes punched therein. The handle is hollow and is truncated squarely at the end. (Cat. Nos. 109813, 109814, U.S.N.M., Oaxaca, Mexico. Collected by L. H. Aymé.) (Pl. 10 *c.*)

Kingsborough⁴ figures a specimen in the fourth volume of his work. The presumption is that these are censers for domestic use.

Through the courtesy of Dr. Walter Lehmann, a photograph of a handle censer from Guanacaste, Peninsula of Nicoya, Costa Rica, has been secured. The specimen is from the Velasco collection, National Museum, San José de Costa Rica. (Pl. 12 *c, d.*) Its resemblance to the Nahuatl censer ladle is apparent, and Lehmann cites its locality as "the Mexican enclave of the Peninsula Nicoya." In point of specialization it is hardly so far advanced as the Nahuatl variety, its decoration is southern, and in some respects it approximates the Zapotec modified tripod. (See pl. 10 *b.*)

Prof. Marshall H. Saville, while carrying on the work of the Heye Expedition to Ecuador, discovered at Manabi a dipperlike vessel, the end of the handle terminating in a clenched fist, resembling in this respect some of the censers found in southern Mexico. It is very small (3½ inches long) and is classed as a censer.⁵

¹ Work cited, 1907, p. 110.

² Work cited, 1908, vol. 3, pp. 604-606.

³ Measurements: Diameter, 5 inches; height, 1½ inches; length of handle, 4½ inches; diameter of handle, 1½ inches.

⁴ Antiquities of Mexico, London, 1830-1848.

⁵ Contr. South Amer. Arch. The George G. Heye Expedition. Antiquities of Manabi, Ecuador. New York, 1907, vol. 1, pl. 54, fig. 5.

Small ladle forms found in the huacas of the Guetaro Indians of Costa Rica are called *incensarios*, but examination of the specimens in the Arellano collection, exhibited at Madrid in 1892,¹ showed only one bearing traces of fire. There is, however, a mask on the handle adjoining the bowl, and the weight of opinion must class them as *incensarios*. Lehmann has discovered ladles of this form near Cartago, Costa Rica. (Fig. 8.)

(d) The most familiar object of this class and the most highly developed is the Nahuatl hand censer spoon having a long handle and decorated with painting and sculpture. This censer was held in the hand of the officiating priest and the fumes of the copal or other incense wafted toward the figure of the god. They are rather frequently found in the Nahuatl area of Mexico, and numbers were unearthed in the trenches near the Cathedral plaza in the Federal district some years ago,² several having been brought to the United States by collectors. Their mode of use may be seen in numerous instances in the picture writings, where the characteristic extended arm holding the censer is graphically depicted.

FIG. 8.—LADLE CENSER, GUETARO HUACAS, COSTA RICA, ARELLANO COLLECTION.

Sahagun describes the offerings made by the Mexicans in their *calpulle*, and mentions that the satraps (attendant chief priests) offered incense day and night in the temples at certain hours.

They used for that purpose censers of terra cotta in the form of a kind of skillet of medium size with a hollow handle of the largeness of a vara in measure and of the length of the arm up to the elbow or a little more, having within little stones which served as rattles. The censer was ornamented with sculptures which are pierced at intervals from the middle to the base. They took in it lighted coals from the fire and they threw on it copal; they approached the statue of the demon and they elevated the censer toward the four cardinal points; at the same time they incensed also the idol. When this was done they threw the coals on the fire. The same practice was imitated by the people in their houses, morning and evening, before the statues which they had in their chapels or in their courts. The parents taught their children to make the same evening and morning.³

Sahagun also tells us that at the feast of Tezcatlipoca everyone carried perfume pots. They made fire in the temple in order to have coals. They carried also copal and censers of terra-cottalike pots,

¹ Alfaro, Anastasio. *Catálogo de las Antigüedades de Costa Rica exhibidas por el Excmo. Sr. D. Julio Arellano. Exposición Histórico-Americana de Madrid. Madrid, 1892*, p. 17.

Hough, *Ancient Central and South American Pottery in the Columbian Historical Exposition at Madrid in 1892. Report of the Madrid Commission, 1892, Washington, 1896*, p. 347.

² Selser, work cited, 1908, vol. 2, p. 856.

³ Sahagun, work cited, p. 183.

pierced and much worked, that they called *tlemaïtl* (*tlell*, fire; *maïtl*, arm). They had also all kinds of copal, and they prepared portions for use in the ceremonies customary in the service of that god. The chief priests, when a certain moment of the service came, took coals in their censers, threw on them copal or incense and incensed the images of Uitzilopochtli that they had installed in the temple a little while before. This ceremony was not only made in this place, it was repeated in all the houses by their proprietors, who incensed the images of the gods which they had at home. When they had finished the incensing they went to deposit the ashes in a round hearth, called *tlexiçtli* (*tlell*, fire; *xiçtli*, navel or cord, leather band), which was placed in the midst of the court where it was elevated two spans above the soil.¹

The United States National Museum collection contains numerous handles of the *tlemaïtl*, all of the serpent design,² which was that commonly used by the Nahuas, and a bowl with a portion of the handle remaining, collected by Dr. Edward Palmer from a cave at Dos Caminos, 25 miles east of Acapulco. The latter specimen is of coarse, brown paste, the handle a hollow tube, the bowl even in outline and perforated with a design consisting of four triangles, arranged as in the Maltese cross, repeated three times, and with a triangle in each of the broad spaces between the four-part design. A plain circular area is left in the bottom of the bowl. The under surface has bands ornamented with small papillæ, and on one side of the bowl, near the edge, project two spurs, perhaps rudimentary feet. (Diameter of bowl, 7 $\frac{3}{4}$ inches; height, 2 $\frac{1}{2}$ inches. Cat. No. 173069, U.S.N.M.) (Pl. 12 a.) The handle is from the Hill of Tepeyac, Mexico, D. F., and was collected by W. W. Blake. It is tubular, of red paste, and shows obscure coiling marks. The head of the fire serpent has extended tongue, open mouth, projecting teeth, and a band across the neck. The mouth of the serpent does not communicate with the hollow of the tube. (Length, 12 inches; diameter, 1 $\frac{1}{2}$ inches. Cat. No. 99081, U.S.N.M.) (Pl. 12 b.)

The writer may be pardoned for introducing at this point for comparison an oriental hand censer which presents remarkable similarity to the Mexican hand censers just described. The specimen is from Japan and is described as an "ancient hand censer," used in temple worship for directing the smoke of incense toward the images of the gods. A dragon is coiled about the handle, and the latter in turn passes around the middle of a constricted vase with foot. It combines the sedentary *koro* with the hand censer, more fully than the Chinese type. (Cat. No. 6330, U.S.N.M. Collected by the late Gen. O. E. Wood, U. S. Army.) (Pl. 11.) The Chinese employ a similar hand censer, but more conventionalized in design.

(c) A tubular incense apparatus, through which or from which smoke may be blown by expulsion of the breath, was anciently used in Mexico, as witnessed by the sculptures of the Palenque altar and

¹ Sahagun, work cited, p. 101.

² The handle sometimes terminated in the talons of the eagle. See Selser, work cited, vol. 2, 1908, p. 863.

drawings in the Manuscript Troano figured by McGuire.¹ This pipe censer is found on ancient sites in the region west of the Rio Grande and south of the great breaks in New Mexico and Arizona. It is a hollow, truncated cone, usually of tuff, often showing traces of red and yellow pigment and from 6 to 14 inches in length, the diameter varying from 1½ to 4 inches. It was found in the larger rooms of ruins, associated with small painted mortars, decorated slabs, and other cult apparatus, and which almost invariably show traces of fire. Its connection with the small tubular "pipes," either straight or frequently bent at a slight angle, found north of the "breaks" and in use at the present day in religious ceremonies by the Pueblos, has been suggested by Dr. J. Walter Fewkes, who says that by interpretation of the Hopi name it is a "cloud blower." Dr. Fewkes informs me that the large pipe used in the Winter Solstice ceremony and called the "great snow pipe" is made especially for the ceremony and has a capacity of about half a pint of the sacred tobacco mixture. It is of clay, not decorated, and the object of its use is to create a big smoke cloud as a petition for snow, exemplifying the "gesture prayer." The writer has observed the use of such tubes in Hopi ceremonies, where the celebrant fills the pipe with aromatic herbs, lights it from the kiva fire, and, inhaling, blows a compact cloud of smoke as an offering to the rain gods or other beings who move in the sky behind cloud masks. The connection is obvious, but often the large size of the southern blower would prevent individual use as above, and some other method of producing the smoke or incense cloud is indicated. Several specimens in the National Museum have orifices through the wall of the blower in its lower half, and one specimen found by the Museum-Gates exploring expedition of 1905 has a series of holes around the base near the lower edge. These orifices may be designed to promote the draft, which may have been increased by the insertion of a reed tube, and they are analogous to the triangular cuts through the basin of the incensarios found in the Calle de las Escalerillas and in other parts of Mexico, as well as those vase forms from the Lacandonese, the ancient Mayas of Yucatan, and the ancients of the Peninsula of Nicoya, Costa Rica. This resemblance, which may seem a mere detail, is significant.

A specimen of the tubular cloud-blower in the National Museum is made of friable tufa deeply colored by the effects of fire. The cavity has been drilled from both ends, the upper portion of the cavity being much larger than the lower, as in the smaller pipes. A shoulder is formed in the upper extremity of the pipe, and through this shoulder a diagonal hole has been perforated into the bowl of the tube, in this way resembling very much the treatment of a Hopi

¹ Pipes and Smoking Customs of the American Aborigines, Ann. Rep. U. S. Nat. Mus., 1887, p. 371, and frontispiece.

field oven with its draft hole. Another perforation extends horizontally through the wall near the base of the pipe. The exterior of the pipe has as fine a finish as the material will bear and is well shaped. Length, $13\frac{1}{4}$ inches; diameters, $2\frac{1}{4}$, $2\frac{1}{2}$, and $1\frac{1}{2}$ inches. (Cat. No. 98228, U.S.N.M., New Mexico. Collected by E. W. Nelson.) (Pl. 13 a.)

Another cloud-blower is of coarse tufa of yellow-brown color, excavated from both ends, giving an hourglass-shaped section; form, a truncated cone with raised molding near larger extremity. Traces of vertical bands of red, yellow, and black pigment appear on the surface. Half of the blower is missing. Found in a ceremonial room of the large pueblo ruin on Spur ranch, near Luna, New Mexico. Length, $8\frac{1}{2}$ inches; diameter, 4 inches; diameter of mouth-piece, $3\frac{1}{4}$ inches; lower end, $2\frac{1}{2}$ inches; orifice, $1\frac{1}{4}$ inches. (Cat. No. 231904, U.S.N.M. Collected by Walter Hough.) (Pl. 13 b.)

In his important and valuable paper on aboriginal pipes and smoking customs,¹ Mr. J. D. McGuire has brought together by far the largest collection of information on this subject. The pipe, this author has pointed out, antedates the use of narcotic herbs, such as tobacco, and he concludes that "the importance of smoke appears to have been chiefly, if not entirely, due to its supposed medicinal properties." Mr. McGuire also points out that the offerings of incense by the Aztecs to the Spanish invaders under Cortés were in many respects similar to the familiar pipe customs of the Indians, and pipes of like shape are traced from southern Mexico to British possessions in the north.

It is manifest that the custom of smoking did not originate in gustatory enjoyment, but following along the line of the development of the fire cult, smoke had an esoteric or sacred meaning. The first offerings would be from a static fireplace, such as the camp fire, and as progress was made in the arts of life the caring for fire in portable appliances would give rise to braziers in great variety—as, for example, the bowl-shaped censer of the Lacandonese and the handled censer of the Nahuatl, which correspond respectively, to the static and handled censers of Japan and China. The swinging censer of Europe is evidently a development of a sedentary vase form. The pipe itself seems to be a development from a sedentary form which has survived in the "great pipes" sometimes occurring among the North American Indians. As an outgrowth of environment, culture, and customs, smaller pipe forms were adopted and the original intention of smoke offerings was much modified by individual circumstances. We have also an interesting analogy between the handled censer in Mexico and the peace pipe used in ceremonies by the North American Indians,

¹ Ann. Rep. U. S. Nat. Mus., 1887, footnote, p. 125.

both utensils showing, it is presumed, the likeness due to similar needs rather than to direct acculturation.

The following is a description of the specimens figured on plate 14: Pipe of gray vesicular rock, shallow bowl, uniform tube leading to center of bowl. Diameter, $1\frac{1}{4}$ inches; height, 2 inches. (Cat. No. 212609, U.S.N.M.) Scorse ranch, near Holbrook, northeastern Arizona. Collected by Walter Hough. (Pl. 14 *a*.)

Made of purple vesicular lava; bowl not much enlarged; tube of large caliber. Diameter, $1\frac{1}{4}$ inches; height, $1\frac{1}{2}$ inches. (Cat. No. 212102, U.S.N.M.) Petrified forest, Arizona. Collected by Walter Hough. (Pl. 14 *b*.)

Of yellow sandstone; bowl large and conical, joined by a small orifice at apex of cone formed in the base. (Cat. No. 149435, U.S.N.M.) Arizona. Collected by R. J. Coyne. Diameter, $1\frac{1}{4}$ inches; height, $2\frac{3}{4}$ inches. (Pl. 14 *c*.)

Of dense, vesicular lava, brown to blue in color, finely finished; the bowl very deep. Diameter, $1\frac{1}{4}$ inches; length, $2\frac{3}{4}$ inches. Petrified forest, Arizona. Collected by Walter Hough. (Cat. No. 212131, U.S.N.M.) (Pl. 14 *d*.)

Pipe of pottery; brown color, surface highly polished, bowl deep, meeting smaller orifice perforating its bottom. (Cat. No. 156132, U.S.N.M.) Length, $2\frac{1}{4}$ inches; diameter, $\frac{1}{4}$ inch. Sikyatki, Arizona. Collected by J. Walter Fewkes. (Pl. 14 *e*.)

FIG. 9.—ANCIENT POTTERY BRAZER—CENSER, CITY OF MEXICO.

Pipe of pottery; exquisitely finished, brown color, stem squared, bowl swelled and terminating in a collar. Length, $2\frac{1}{4}$ inches; diameter, $\frac{1}{4}$ inch. (Cat. No. 213250, U.S.N.M.) Awatobi, Arizona. Collected by the Museum-Gates Expedition, 1901. (Pl. 14 *f*.)

Pipe of brownish tufa; bowl and stem of equal length, side of bowl decorated with cross formed by small holes drilled in the material. Length, $2\frac{1}{4}$ inches; bowl, 1 inch by 3 inches. (Cat. No. 234768, U.S.N.M.) Jemez, New Mexico. Collected by Mrs. Matilda Cox Stevenson. (Pl. 14 *g*.)

Pottery pipe exquisitely finished, mouth portion flared; body ridged as though wrapped with cord, except collar portion at the forward end. Length, $2\frac{1}{4}$ inches; diameter, $\frac{1}{4}$ inch. (Cat. No. 156154, U.S.N.M.) Awatobi, Arizona. Collected by J. Walter Fewkes. (Pl. 14 *h*.)

Pipe of dark gray stone, well finished; bowl, shallow cone; base flattened and expanded. (Cat. No. 234769, U.S.N.M.) Jemez Plateau, New Mexico. Collected by Mrs. Matilda Cox Stevenson. Length, $2\frac{1}{4}$ inches; diameter, $\frac{1}{4}$ inch. (Pl. 14 *i*.)

Pipe of brown pottery consisting of a flaring stem; circular bowl surmounted by a broad collar ornamented with cross-shaped design in perforations and scratched on the surface. Length, $2\frac{1}{2}$ inches; diameter, $1\frac{1}{2}$ inches. (Cat. No. 244762, U.S.N.M.) Jemez Plateau, New Mexico. Collected by E. L. Hewett. (Pl. 14 j.)

Pipe of pottery, quadrangular shape, rounded at the base and with a collar near the mouth, decorated on two sides with the lightning arrow. The pipe bears a black, highly lustrous polish. (Cat. No. 47759, U.S.N.M.) San Juan Pueblo, New Mexico. Collected by J. W. Powell. Length, $4\frac{1}{2}$ inches; $1\frac{1}{2}$ inches by $\frac{7}{8}$ inch. (Pl. 14 k.)

(f) *Cigarettes*.—

Still another form of offering is the section of cane tube charged with vegetal incense found rather generally in the Pueblo region, but especially in the southern portion.

The cigarette is filled with a mixture of herbs, which, when burnt, produces a pleasant odor, but generally the tubes packed with the mixture



FIG. 10 (a, b, c, d, e).—REED CIGARETTES WITH CINCTURE, ARIZONA.
COLLECTED BY HOUGH AND COOLEY.

have not had fire put to them and obviously the offering is by implication. In some cases, however, the cigarettes have been lighted at the time of offering, as in certain shrines observed in caves on the Blue River, Arizona, these usually being the larger canes of functional size and not the miniature tubes which occur in such great profusion.

The cigarettes (fig. 10) are girdled with strands of white or dyed cotton cord; miniature blankets and sometimes beads or feathers are attached, the object in the mind of the worshipper being to duly clothe

these offerings in consonance with the belief that they were animate, and, further, that they represented the human body, as has been pointed out with regard to the censers and braziers. Rudiments of this girdle are seen on small tubular pipes from northern Arizona (pl. 14 *f*, *h*, *j*, *k*), which appear to show their relation to the cane incense tube, and it is probable that the longer plain tubular pipes were girdled with cord and feathers at the time of offering, as in some modern Pueblo examples.

Similarly, some of the Mexican pottery censers of hourglass shape bear a girdle in relief representing the cord tied in a symbolic bow. (Fig. 9.)

There is also a close connection with respect to the cigarette between the Mexicans and the Pueblos. Abundant references in the writings of the chroniclers show that cigarettes cut from reeds, painted in various patterns and colors, filled with different kinds of odorous herbs and other aromatic substances pulverized and mixed together, were smoked ceremonially.

3. SWINGING CENSERS.

(a) The swinging censers which remain to be discussed are not indigenous to the Western Hemisphere, but have been introduced by the religious orders. The Museum possesses a specimen from the Oxchiri Indians of Chiapas, Mexico, which shows an interesting adaptation of native materials and art. It consists of an hourglass-shaped basket of ixtle cord twined over a coiled rod. At the narrowest portion are attached four braided cords which are bunched at the ends and form a sling by which the censer may be swung. These cords can be drawn together with a sliding ring. The incense, of copal, is burned in a bowl of earthenware which fits in the larger concavity of the basket, and the apparatus is presumed to have been used in the celebration of mass in the poor country churches attended by Indians not possessed of a metal censer. Diameter, top, $5\frac{1}{4}$ inches; bottom, $5\frac{1}{4}$ inches; height, $4\frac{1}{4}$ inches; length of cords, 23 inches. Collected by L. H. Aymé. (Cat. No. 76895, U.S.N.M.) (Fig. 11.)

FIG. 11.—SWINGING CENSER HOLDER, INDIANS OF OXCHIRI, CHIAPAS. COLLECTED BY L. H. AYMÉ.

REMARKS ON THE CENSER IN SOUTH AMERICA.

The apparatus discussed in this paper is most prevalent in central and eastern Mexico, less so in Central America, and gradually diminishes through the South American cultures. Information concerning South American cult apparatus is extremely limited because the historical and linguistic nexus has been lost, and no knowledge is recoverable from a vocabulary of symbolic art, so rich in Mexico. The tripods and stool forms of Chiriqui, described by Holmes,¹ some of the carved stone metates, pottery vessels of tazza and tripod forms of Ecuador and Peru may have been designed as censers, but beyond their relationships in shape and in some features of construction and adornment no approximately conclusive data can be put forward concerning South American censers. Incense was offered on the figure braziers of Ecuador, and no doubt incense was known in Peru and Bolivia, but little has been published of the vast stores of relics from this area in museums.

DISCUSSION OF THE USE OF INCENSE IN WORSHIP.

The offering of incense is almost universal. Tribes which have reached a stage where recurrent rites are observed, and where ceremonies have attained some complexity, make use of this feature of the fire cult, and below this grade of culture individual or family acts of worship often show the employment of incense or fire offerings.

While fire may be primary in regard to the origin of the idea of incense, it became secondary as applied to advancing cults; that is, offerings were not confined to the communal house or camp fire, but were made on special hearths or in special apparatus. Nevertheless, no incense was so offered that was not ignited from a sacred fire; that is, one carefully prepared to insure purity, and secured from the ancient wood drill, from lightning, lens, mirror, or other consecrated or supernatural source. New fire is kindled by the Lacandones of Chiapas by wood friction for use in consecrating censers and igniting copal burned at that time.

The new fire is thought by the Lacandones to be efficacious in healing sickness, the soot collection on palm leaves being the common method, but a stone heated in the fire and used to warm water renders the latter a panacea for fever.²

The phenomena which accompany combustion are so familiar that the man of our times passes over the marvel of smoke, flame, and ashes without analysis or comment. To the man of a certain stage of advancement we may suppose that the wonder of the birth,

¹ Ancient Art of the Province of Chiriqui, Colombia. Sixth Annual Report of the Bureau of American Ethnology, 1888.

² Tossar, work cited, 1907, p. 164.

life, and death of fire was a vivid reality; it is evident from a survey of the widespread remnants of the fire cult that the steps of this mysterious physical manifestation impressed his mind, determined an attitude (creed), and predicted a course of action (cult) in consonance with the observed facts of fire action.

The lore of smoke is extensive, embracing individual acts and collective acts relating to fumigations both sacred and profane. The ideas relative to the purification, healing, scaring of demons, removing of evil influences, etc., effected by smoke have been in the minds of votaries of fire worship in divers countries and periods, and it is even probable that fumigations alluded to by Shakespeare, in *Much Ado About Nothing*, where a perfumer is ordered to smoke a musty room, or when in *The Taming of the Shrew* the command is given, "And burn sweet wood to make the lodging sweet," there was also involved some antique belief in dispelling bad influences, which may be classed as primitive sanitation.

The use of smoke in worship, however, seems to have arisen from the observation that this ghostly element of combustion dissolved in the air, passing away from sight mysteriously, like fog and cloud vapor, thus supplying a messenger to the unseen. It must not be forgotten also that to unspoiled senses the odor of smoke would be strikingly pungent and perhaps the most remarkable attribute of fire, a potent and far-reaching means of calling the attention of supernatural beings, propitiating or frightening them. The Homeric and Jewish idea was that a sweet savor was pleasing to divinity, and this appears to be the most widely diffused idea connected with the burning of incense in worship, while offerings to the fire which at one time were customary may have been for the double purpose of pleasing the spirits with incense, and of feeding them. The offering was consumed by the fire and disappeared from human sight, thus being analogous to the practice of throwing offerings into springs or rivers.

Mr. J. N. B. Hewitt informs the writer that the Iroquois use tobacco smoke to make authentic a petition, and states that in the New Year ceremony the Life God, whose vitality is supposed to wane during the year, presents a petition for restoration, and in order to give value to his petition a portion of the rite is marked by the burning of tobacco for this purpose. The solemn ceremonies also connected with the calumet may involve this idea. The calumet is passed around in order of official seniority during the council and he who holds it affirms his speech by blowing a cloud of smoke. Similarly, in the ratification of peace, the pipe was an important adjunct, without which the terms would not be binding. It is probable here, as in many other rites connected with the use of incense, that the smoke is designed to open communication with

the spirit world by attracting the attention of the intangible beings. Mr. Hewitt says, however, that it is the tobacco rather than the odor that is offered as a sacrifice to the deities; that is, the soul, or the reality, of the tobacco is what reaches the gods. By means of separate acts there is a twofold use of tobacco in a peace or other council—the one to compose the minds of the councilors and the other to invoke the good-will of the gods to whom it is offered in sacrifices.

Incense was probably at first the smoke of wood or of leaves, then later selected, compounded of several materials, and made sacred by rites.¹ It was finally sought all over the world, and a commerce in “frankincense and myrrh” was one of the chief agencies in bringing a knowledge of the people of the Tropics to those of northern zones.

The incense from South America, according to Humboldt,² was from the *Icica gujanensis* and *Icica tacamahaca*. That used most commonly in Mexico and Central America was the gum of the *Protium heptaphyllum*, called copal by the Spanish. This tree is also a *Bursera*, from which genus the most precious incense gums of the world are derived. “The Mexicans and all the inhabitants of New Spain made use (which they pursue yet somewhat to-day) in their offerings of that incense of copal, a kind of white gum which they call *copalli*, for incensing their gods. They had not recourse to our true incense, because it was not found in their country. It was copal that the satraps used in the temple and everyone in the private houses, as we have said above.”³ Tozzer states that the sap of the rubber tree was used by the Lacandones. The wood and leaves and the resins of the pine trees in Mexico had important cult uses. Pine needles are used as incense by the Hopi, as they are by the Tibetans.

In the descriptions of the home life of the Mexicans, transmitted by the early chroniclers, it is stated that vases filled with smouldering incense diffused their perfumes through the rooms,⁴ and numerous mentions of such usage give the impression that it was customary to burn odorous substances as a matter of refinement and for personal pleasure, just as the use of tobacco became secularized.

INCENSE MATERIALS.

In the course of time, with the growth of ceremonies and the increasing complexity of culture, incense became differentiated into kinds and preparations appertaining to the various deities and celebrants. There may have been many prescribed varieties of incense, and of

¹ The Jews had at first 4 ingredients and later 13. Numbers, xvi.

² Cosmos, vol. 2, p. 204.

³ Sahagun, work cited, p. 183.

⁴ Bancroft, Native Races, vol. 2, p. 573.

those whose names have survived in the chronicles are *copal blanco* white copal, with mixtures of tobacco, etc.; *incenso comun*, ordinary incense; and *chapopopolti*, bitumen, the latter used in the worship of the god of war, Huitzilopochtli, all the foregoing being employed by the Nahuas. The Mayas used copal; copal ground with maize; caoutchouc; *zacah*, a kind of incense burned by priests; and *chachalte*, burned by nobles.¹

The Mexicans, like other peoples in close touch with their environment, were acquainted with the properties of plants, and to this day the exhaustive pharmaceutic and utilitarian botany of a village market is one of the most surprising things one meets with in that country. The ancient Mexicans had thus ransacked the plant world for vegetal substances, which on burning would produce an agreeable odor, many of which are mentioned in the works of Hernandez, Monardes, and others, but whose identification botanically is almost invariably impossible owing to incomplete characterization.

Dr. S. A. Barrett informs me that at the present time the Cayapas use in Ecuador for religious feasts a sort of whitish resinous substance (copal) which comes from the interior of the country. They do not have very much of it, and prize it very highly on account of having come from such a distance. They burn this substance at the time of a death.

There is a great confusion as to the identity of copal, the name, according to some writers, being used to cover a number of gums. It is possible that the confusion has arisen from post conquest times when errors multiplied rapidly as the Mexican culture slipped swiftly into the background, for the earliest reliable chroniclers are clear as to the commonest use of the gum which we know as copal, and whose characteristic odor would place it distinctly in the first rank of incense materials.

The following notes from Sahagun refer to various vegetal sources of incense substances burnt for the odor:

There is a plant called *quahyayacual*. Its roots are long and become green at the ends. The leaves are small and round. The exterior of the plant mixed with incense acts as perfume. The root is of no utility. They find the plant on the mountains.²

There is another plant called *tlalpoyomalli*, of which the leaves are ashy, soft, and velvety. It has flowers. Its odor has caused it to be chosen for the perfumes which they introduce into the reeds for smoking. Its aroma spreads far.³

This appears to be the artemesia, sage, which was a sacred plant among the Pueblos and many other tribes of Indians.

There is a small wild tree called *teocote* (*Pinus teocote*), of which the root has the odor of incense when it is burnt. Only the lords and the dignitaries have the privilege of using it. Other persons are not authorized and have not the right to use it.⁴

¹ Bancroft, *Native Races*, vol. 2, p. 702; Tzozzer, *op. cit.*, 1903, p. 20.

² Sahagun, *work cited*, p. 753.

³ *Idem*, *work cited*, p. 765.

⁴ *Idem*, *work cited*, p. 731.

There is a tree from which exudes the white resin called copal, which is the incense offered to the gods by the Mexicans. They sell it now very much in the markets, because it is employed as a remedy and is good for a great number of things. It is produced in the Provinces of Tepequaciulco, Yonala, and Conixco.

There exists a tree called *ocotzoganmil*, "resin tree" (*Liquidambar styracifolia*). It is high, large, and has leaves like the willow. It exudes a resin that they employ in the reeds that serve for smoking.¹

Prof. Frederick Starr figures modern Mexican incense burners, and gives numerous instances of the continuance of the practice which still maintains the demand for copal, and rolls of this gum wrapped in corn husk may now be found on sale in the markets of Mexico.² It is usually formed into a roll about three-fourths of an inch in diameter and 6 inches long, enveloped in corn husk, or wild plantain, tied at either end and around the roll with strips of fiber. The National Museum has a specimen (Cat. No. 261999, U.S.N.M.) collected in Tampico by Dr. Edward Palmer. (Fig. 12.)

Tobacco was also a sacred herb, and its smoke was unquestionably incense. The wild tobacco plant is incorporated in the mixture used as incense by the Hopi and some other American tribes. Seler states that tobacco "played precisely the same part among the priests and



FIG. 12.—COPAL PREPARED FOR MARKET, TAMPICO, MEXICO. COLLECTED BY EDWARD PALMER.

medicine men or ancient Mexico as it has from the remotest times down to the present day among the various savage tribes of North and South America."³ It was powdered and mixed with incense and formed into pellets which were carried in a pouch by officiating priests. In other parts of the United States artemesia, the balsam root, cedar tops, sweet grass, and, among the Siksika, a sweet gum of some kind were burned for incense.⁴

There must exist implements and utensils connected with the gathering and preparation of incense, but which are not recognized as such. The powdering of copal, mixing it with tobacco and other substances, forming it into pellets or nodules with the aid of heat, manipulations necessary to prepare the incense for formal offering, in all likelihood did not necessitate the employment of special apparatus, but was performed with domestic utensils, such as the metate and mortar, cooking vessels or comal, the pellets formed with the hands like any plastic substance. The industry in the ancient days also

¹ Sahagun, work cited, p. 732.

² Notes upon the Ethnography of Mexico. Davenport Academy of Science, vol. 9, Davenport, Iowa, 1902.

³ Bulletin 28, Bureau of American Ethnology, 1904, pp. 146-147.

⁴ Handbook of American Indians, Bulletin 30, Bureau of American Ethnology, Washington, 1907-1910.

undoubtedly required the services of many persons from the sources through commerce to the consumers, who were the families (clans) and the priesthood attendant on the *teocallis*.

In the caves of southern Arizona there have never been found definite masses of resin or anything which might be called incense outside of the herbs contained in sacred cigarettes. Nevertheless, there are often attached to offerings resinous substances which have an odor resembling that of copal.

CUSTOMS CONNECTED WITH THE USE OF INCENSE.

Some of the numerous customs connected with the use of incense are collated and introduced here. These have a bearing on the beliefs under whose sway the incense cult came to be practiced and which have an explanation far from simple, depending largely on the plane of philosophy reached, and modified by local and individual habits of thought and traditions.

Sahagun tells us that there were persons whose office was to provide copal, incense plant, censers, torches, and wood for the temple service,¹ and speaks of the *Tlacoqluacuilli*, who were the guard of the temple *Mecatlan*. "They were clothed in the manner we have described for the priests—that is to say, a jacket *unxicolli*, and carried a calabash full of tobacco, *picietl*" (p. 192). Further, "the chief priest, *Mexicatl teohuatzin*, 'Mexican master of the gods,' was elected by the two great priests and had charge of the hierarchy. His costume was a jacket of cloth, a censer of the form of which they made use, and a pouch filled with copal for incensing."² And further: "The chief priests and ministers of the temple were charged not to allow the fire in the court go out and to wake up those who had the mission of sounding the hours or those who should burn incense and make offerings before the idols."³

During the ceremony of incensing the god *Huitzilopochtli* each priest placed coals and *chapopopotli*⁴ incense in his *tlématl* and wafted the disagreeable odor toward the idol. The ashes were then emptied from the censers into an immense brazier called the *tlaxictli*, or fire navel.⁵

Aztec monarchs were anointed, and during this ceremony burned incense to the god *Huitzilopochtli*. "A censer containing live coals

¹ Work cited, pp. 190-198.

² Sahagun, work cited, p. 189; Chavero, Mexico, p. 635, figures a priest burning copal, holding the *tlématl* in the right hand and a bag in the left.

³ Work cited, p. 187; sea shells, cornets, and trumpets were used to sound time. Work cited, p. 189.

⁴ "Chapopotli is a bitumen which resembles the pitch of Castile when it is friable. It is washed up on the beach, usually at high tide and is gathered by the river peoples. It is odorous and is much liked by women. When thrown on the fire its odor spreads widely. It is mixed with the mass which they are in the habit of putting in the odoriferant chalumeaux. They mix *tsictli* (chicle) with the copal, or incense of the country and with the odorous resin, and they obtain thus good perfume." (Sahagun, p. 630.) See also Torquemada *Monarchia*, vol. 11, p. 266.

⁵ Bancroft, *Native Races*, vol. 2, pp. 322-323.

was put in his right hand, and into his left a bag of copal, and thus accoutred and provided, he proceeds to incense the god Huitzilopochtli."¹

In the feast of Tezcatlipoca priests incensed the idol, praying that their prayers might rise to heaven as the smoke of the burning copal.²

Incense played an important part in marriage ceremonies, and the contracting parties as well as the household gods were perfumed from the censers.³

The Mexicans gave themselves up to a certain superstition to cure sick or sickly infants. They attached to their necks a ball of copal by means of a soft cord of cotton, and they made the same for the wrists and ankles. Astrologers did this under a propitious sign and designated the number of days that they should be borne. They attended to detaching them, and they went at once to burn them all in the capulco. They repeated this four times for each treatment of the child.⁴

Incense was burned to the cardinal points at the feast of the merchants.⁵

In respect to verification the Mexican custom was similar to that of the Iroquois. Sahagun says:

He touched his hand to the earth and licked the dust that attached to it. He threw then copal on the fire, because that is another way to make oath to say the truth.⁶

Further he says:

The judges did the same before they performed any act of their ministry. Before ceasing their work, they threw copal on the fire to reverence their gods and asked their aid. The singers of *areytos*, before commencing to sing, burned likewise copal in honor of their gods and asked their protection.⁷

They offered morsels of what they had taken to eat to the fire. The custom was called "act of throwing." They also did not drink pulque until a small quantity was placed in a pot near the fire as an offering. Later they threw it out in four different places around the fire.⁷

These Indians revered greatly and honored with sacrifices the Gemini, which are found near the Pleiades, in the constellation of the Bull. They employed for that different ceremonies at the time when that constellation appeared newly toward the east, after the feast of the sun. They said after they had offered incense: "Yoahtecutli, Yacaniztli is arisen; what will happen this night? Will the influences be prosperous or adverse?" They offered incense three times, without doubt because the constellation is composed of three stars. These offerings took place at the first hour of night, at 3 o'clock in the morning, and at the first glimmer of the dawn. They called these stars "Mamalhuaztli." If they applied the same word to the sticks which served to produce fire, it is because these Indians found in these sticks of wood some resemblance with the three stars and with what they saw of the origin of the process. There obtained also among the young men the custom of making burns on the wrist in honor of that

¹ Bancroft, *Native Races*, vol. 2, p. 145. after Sahagun.

² Idem, p. 318.

³ Idem, pp. 266-269.

⁴ Sahagun, work cited, p. 188.

⁵ Bancroft, *Native Races*, vol. 2, p. 393.

⁶ Sahagun, work cited, p. 24.

⁷ Idem, p. 184.

constellation. They said that one who did not bear these marks at the hour of death would live in hell for the production of fire because they would light it over his wrist by the same process that they employ to produce it by means of morsels of wood.¹

The Pipiles burned incense at the four corners of a field before weeding.²

The Mayas and Mexicans burned incense over the grave of the dead.³

A curious instance of substitution in which copal plays a part has been recorded of the Mayas, who during the feast of the month of Mac burnt the hearts of various animals, and if real hearts could not be procured, imitations were formed of copal and sacrificed on the fire.⁴

Another singular custom of the Mayas is referred to by Bancroft:

Respecting their ceremonies before giving battle we only know that on one occasion in Yucatan they brought a brazier of burning perfume which they placed before the Spanish forces, with the intimation that an attack would be made as soon as the fire went out.⁵

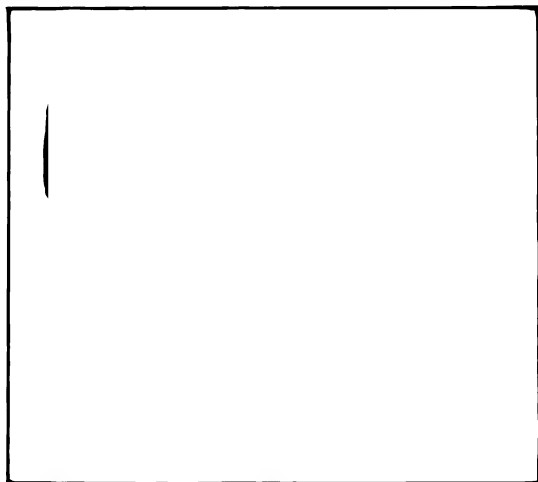
¹ Sahagun, work cited, p. 482.

² Bancroft, *Native Races*, vol. 2, p. 720.

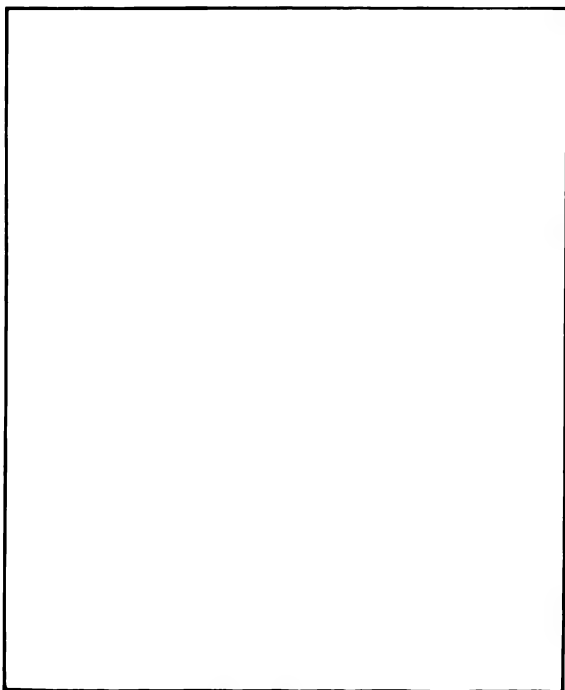
³ Idem, p. 790.

⁴ Idem, p. 692.

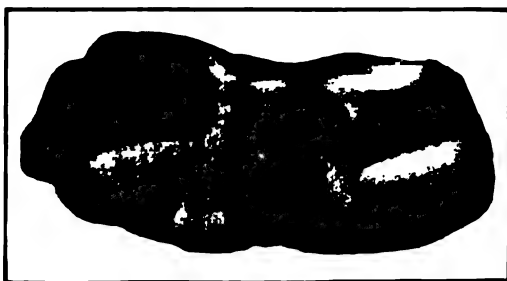
⁵ Idem, p. 746.



a



b



c

STONE BRAZIER FROM MEXICO AND CENTRAL AMERICA.

FOR DESCRIPTIONS OF FIGURES SEE PAGES 113, 114.

a

b

c

BRAZIER OF POTTERY FROM MEXICO CITY.

Courtesy of Dr. Nicolas León.

FOR DESCRIPTIONS OF FIGURES SEE PAGE 115.

a

b

MORTUARY VASES OR BRAZIER FROM MEXICO.

Courtesy of Dr. Nicolas Léon.

FOR DESCRIPTIONS OF FIGURES SEE PAGE 115.

a

LARGE BRAZIER OF POTTERY FROM MEXICO CITY.

Courtesy of Dr. Nicolas Léon.

FOR DESCRIPTIONS OF FIGURES SEE PAGE 116.

b

a

b

c

d

CENSERS FROM MEXICO AND CENTRAL AMERICA.

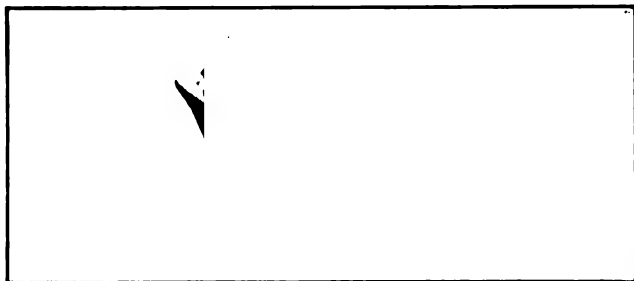
FOR DESCRIPTIONS OF FIGURES SEE PAGES 117, 119.

a

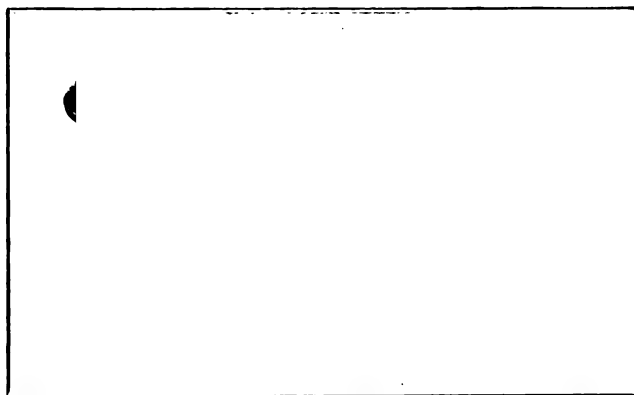
TRIPOD CENSERS FROM MEXICO AND CENTRAL AMERICA.

FOR DESCRIPTIONS OF FIGURES SEE PAGES 119, 120.

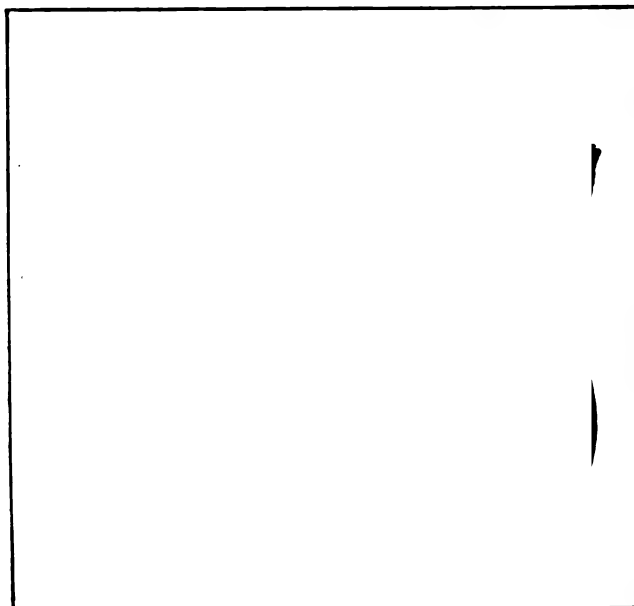
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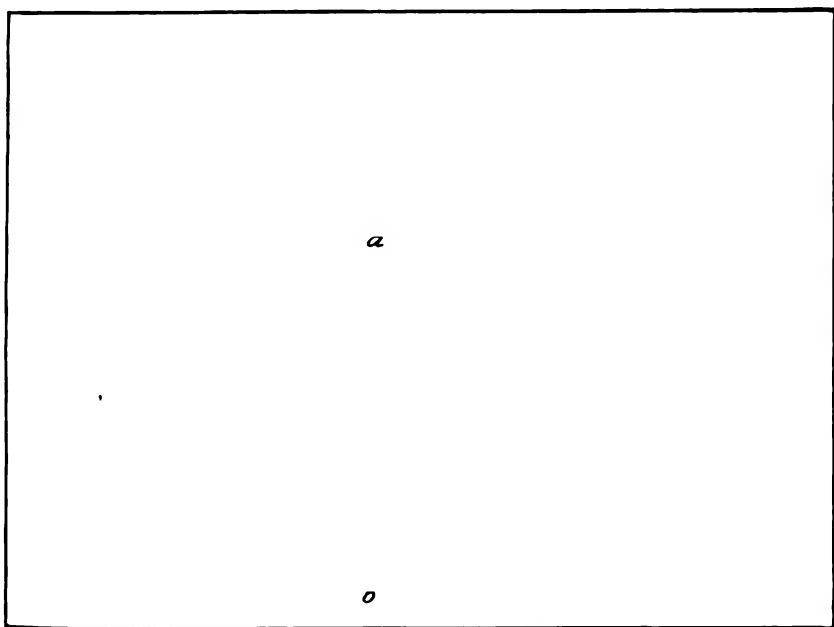


c

VASE AND HANDLE CENSERS FROM MEXICO.

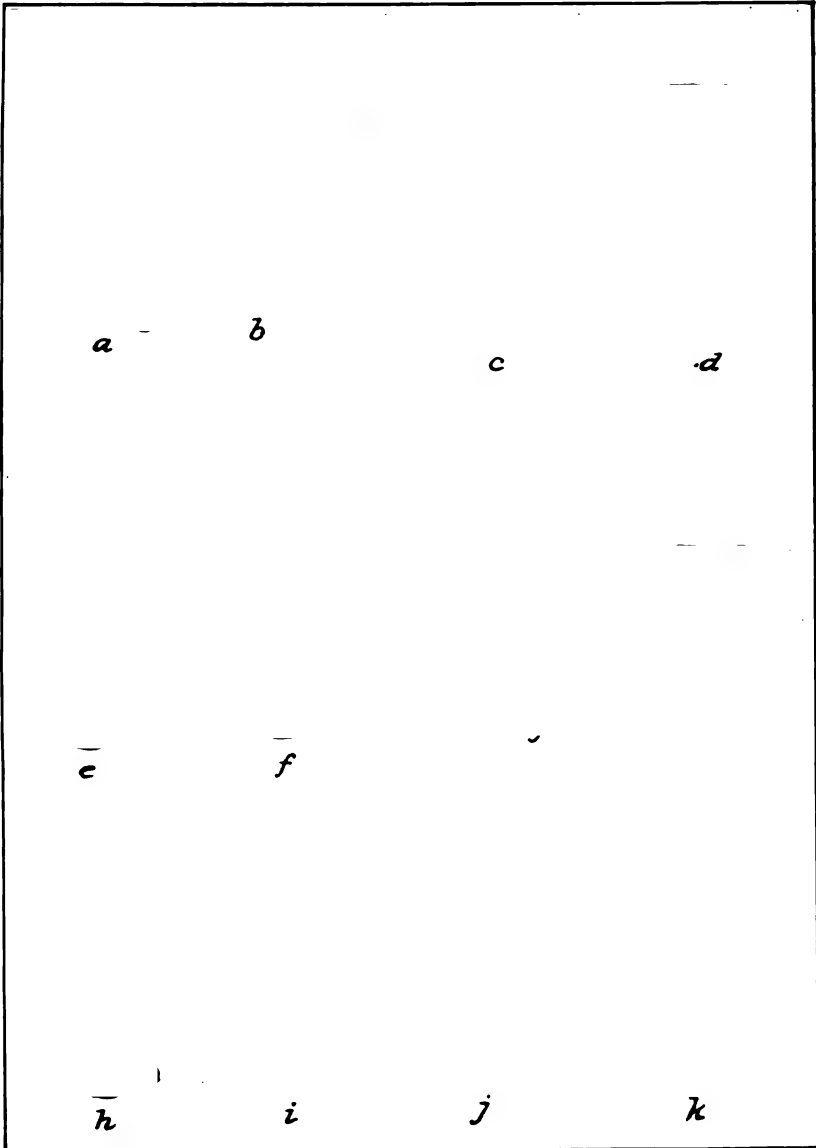
FOR DESCRIPTIONS OF FIGURES SEE PAGES 121, 122.

HAND CENSER FROM JAPAN.
FOR DESCRIPTION OF FIGURE SEE PAGE 124.



INCENSE TUBES FROM NEW MEXICO.

FOR DESCRIPTIONS OF FIGURES SEE PAGE 126.



TUBULAR PIPES FROM ARIZONA AND NEW MEXICO.

FOR DESCRIPTIONS OF FIGURES SEE PAGES 127, 128, AND 129.

DESCRIPTIONS OF FIVE NEW GENERA AND TWENTY-SIX NEW SPECIES OF ICHNEUMON-FLIES.

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The genera and species here treated are reared parasites of which, in many cases, names are desired for use in connection with papers on their economy that are to be published in the near future.

Family BRACONIDÆ.

APANTELES (APANTELES) FUMIFERANÆ, new species.

Female.—Length, 2.5 mm. Related to *A. edwardsii* Riley, from which it differs in the sides of the second dorsal plate being nearly parallel and shorter than the same plate is long down the middle; in the reddish-stramineous femora, the hind pair of which is tipped with fuscous; in the hind tibiæ being reddish-stramineous except at base and apex; in the blackish stigma; in the comparatively shorter ovipositor; in the black tegulæ and in other less important particulars.

Male.—Sufficiently similar to the female to be readily associated therewith.

Type.—Cat. No. 14309, U.S.N.M.

Type-locality.—Montcalm, Quebec, Canada.

Specimens that emerged June 18, 1911, at Chicoutimi, Quebec, Canada, and June 20, 1911, at the type-locality, constituting the type and paratypes, were received by the Bureau of Entomology, United States Department of Agriculture, from Dr. C. Gordon Hewitt, who reports this species as a parasite of the spruce budworm *Tortrix fumiferana*.

APANTELES (APANTELES) PRODENIÆ, new species.

Female.—Length, 2 mm. Head apparently wider than long; black; antennæ mostly dark brown, palpi pale, legs mostly stramineous, all coxæ black, trochanters dark, hind tarsi and apex of hind tibiæ infuscated, tegulæ blackish; scutellum dullish, sparsely punctured; propodeum with five or six areas, the areola almost quadrate; first abdom-

inal segment almost parallel sided, half again as long as wide at apex, geniculate, the apical two-thirds without a fovea, basally roughened and with a few scattered punctures; second plate nearly three times as wide at base as long down the middle, its apical margin arched; hypopygium extending a little beyond the pygidium, sheaths of the ovipositor about as long as the first dorsal plate; wings almost colorless, costa and stigma dark brown, radius, transverse cubitus and third abscissa of cubitus rather stramineous, most of other veins nearly colorless.

Male.—Essentially as in the female.

Type.—Cat. No. 14310, U.S.N.M.

Type-locality.—Bangalore, Mysore, India.

From larvæ of *Prodenia littoralis*, on authority of L. C. Coleman.

APANTELES (APANTELES) TARAGAMÆ, new species.

Female.—Length, 2 mm. Related to *Apanteles tischeriæ* Viereck, from which it can be distinguished by the first dorsal plate being hardly one and one-half times as long as wide at apex, its apical half roughened, without a fovea and nearly parallel sided; second plate at least nearly four times as wide at base as long down the middle; wings, including the stigma, almost entirely colorless, costa tinged with brown; sheaths of the ovipositor nearly as long as the abdomen.

Male.—Essentially as in the female; apical half of first dorsal plate with converging sides, second dorsal plate narrower at base than in the female.

Type.—Cat. No. 14311, U.S.N.M.

Type-locality.—Bangalore, Mysore, India.

From larvæ of *Taragama dorsalis*, on authority of L. C. Coleman.

APANTELES (APANTELES) TISCHERIE, new species.

Female.—Length, 2 mm. Agrees with the original description of *Apanteles prodeniæ* Viereck, except as follows: Legs mostly black or blackish, scutel polished, apparently impunctate; first dorsal plate about one and one-half times as long as wide at apex, its sides arcuate, somewhat wider at apex than at base, geniculate, its apical two-thirds roughened and with a median fovea; second plate with its apical margin virtually straight, hypopygium hardly surpassing the pygidium.

Male.—Essentially as in the female.

Type.—Cat. No. 14312, U.S.N.M.

Type-locality.—Woodside, Delaware, August 9, 1905. Parasite of *Tischeria malifoliella*. S. H. Darby, collector.

This is the same as the MS. species of Ashmead that has appeared in the literature on economic entomology, and occurs in Connecticut and very likely elsewhere along with its host.

APHIDIUS COLEMANI, new species.

Female.—Length, 2 mm. Related to *Aphidius rosæ* Haliday, from which it may be distinguished as follows: Mostly blackish; head uniformly blackish, clypeus, edge of malar space, and mouth stramineous; flagel 14-jointed; mesonotum black; notauli virtually wanting; scutel black, prothorax yellowish; propodeum black, with a diamond-shaped areola and a petiolarea, the areola adjoining four other areas; second, third, and fourth segments largely blackish, first segment partly brownish, apical half of abdomen mostly yellowish, sheaths pale.

Male.—Flagel 17-jointed; abdomen almost entirely black, the first segment brownish; otherwise essentially as in the female.

Type.—Cat. No. 14313, U.S.N.M.

Type-locality.—Bangalore, Mysore, India.

From *Aphis* sp. on tobacco, on authority of L. C. Coleman.

A study of the male paratopotypes shows that the flagel may be 16 or 17 jointed with the end joint in the 16-jointed specimens nearly as long as the preceding joint or decidedly longer.

Named for Mr. L. C. Coleman.

METEORUS ARCTICIDA, new species.

Female.—Length, 4 mm. Related to *Meteorus obfuscatus* Nees, from which it differs chiefly as follows: Antennæ 31-jointed, all joints of the flagel distinctly longer than wide, brownish; ocelli apparently a little nearer the eye margin than to each other; head brownish; occipital carina rather angulate in the middle and at most nearly twice as far from lateral ocelli as the latter are from each other; thorax mostly brownish-stramineous, prescutum separated from the parasides by sculpture rather than impressed notauli, prescutum with a median longitudinal line of sculpture; stigma dark throughout; propodeum almost uniformly reticulate throughout, concave posteriorly; apical third of hind tibiæ and their tarsi more or less infuscated; stigma almost entirely dark, fuscous; fossæ of first segment poorly developed, post petiole striate throughout, petiole stramineous, post petiole rather brownish; second and third segments mostly rather stramineous, rest of dorsum of abdomen blackish down the middle, stramineous laterally; exerted portion of ovipositor nearly as long as the abdomen.

Male.—Essentially as in the female.

Type.—Cat. No. 14314, U.S.N.M.

Type-locality.—Agumbi, Mysore, India, from *Arctiid* larvæ, September 14, 1910, on authority of L. C. Coleman.

METEORUS TRACHYNOTUS, new species.

Female.—Length, 4.5 mm. Related to *Meteorus incompletus* Provancher, from which it may be distinguished by the antennæ, which are at least as long as the body, by all the joints of the flagel being longer than wide; by the almost entirely yellowish head; by the nonprominent prescutum; by the coarse carinæ of the propodeum; by the poorly defined basal area of the dorsal aspect of the propodeum; by the poorly defined petiolarea; by the channeled posterior face of the propodeum, which channel is more or less bounded by trenchant carinæ; by the prothorax being stramineous; by the mesosternum and somewhat more than the lower half of the mesopleuræ being pale brown; by the hind tibiæ and tarsi being more or less infuscated; by the second and third dorsal segments of the abdomen being pale to dark brown; by the sides and venter of apical half of abdomen being brownish; and by the exerted portion of the ovipositor being somewhat shorter than the abdomen.

Male.—Closely resembles the female; its propodeum hardly channeled; its second dorsal segment yellowish.

Type.—Cat. No. 14315, U.S.N.M.

Type-locality.—Maniwaki, Quebec, Canada.

Type and paratypes reared June 20 and July 3, 1911, in connection with rearings of *Tortrix fumiferana*. Received by the Bureau of Entomology, United States Department of Agriculture, from Dr. C. Gordon Hewitt. In two female paratopotypes the mesothorax is almost entirely black or blackish; in one the prothorax is mostly blackish.

MICROBRACON HYSLOPI, new species.

Female.—Length, 3.5 mm. Related to *Microbracon cooki* (Ashmead), from which it differs in the almost entirely black head; in the dorsulum, prothorax, and scutel being more or less reddish; in the costa of the stigma being stramineous, in the furrow of the mesopleuræ being more distinct and reddish; in the legs being blackish excepting the fore femora and tibiæ and part of mid and hind tibiæ, which are more or less stramineous; in the better defined triangular area of the first segment, which is black and flanked basally by reddish pieces; in the color pattern of the rest of the abdomen, which mimics the pattern in *M. nigradorsum* (Ashmead) and consists in the second segment being almost entirely reddish, in the disks of the third, fourth, and fifth segments being black, bounded laterally by reddish, rest of the abdomen above mostly reddish; in the second segment being rather rugose in the middle, elsewhere as the third, fourth, and fifth segments, delicately sculptured, rather pebbled, but still polished, and in the second suture being more distinct; ovipositor approximately as long as the abdomen.

Type.—Cat. No. 14316, U.S.N.M.

Type-locality.—Pullman, Washington, reared August 10, 1909, from *Etiella zinckenella* by J. A. Hyslop under Webster No. 5935, Bureau of Entomology, United States Department of Agriculture.

Named for Mr. J. A. Hyslop.

MICROBRACON PSILOCORSI, new species.

Female.—Length, 2.5 mm; ovipositer, 1 mm. May serve as typical of a species group having the first dorsal segment trapezoidal with its sides about as long as it is wide at apex, its base nearly two-thirds as wide as the apex, its spiracles on a projection which extends beyond the outside line of the segment and with a partially circumscribed basal medial area on the second dorsal segment defined by two oblique furrows converging from the base to a little beyond the middle, but not uniting; the tegument is mostly smooth and polished, otherwise essentially as in *Microbracon mellitor* (Say); head mostly stramineous, mandibles mostly yellow, antennæ dark brown to blackish; thorax and legs to a large extent stramineous, dorsum of thorax infuscated, the parapsidal furrows and their borders as well as the scutel rather stramineous; apical tarsal joints, apex of hind tibiæ as well as all of hind tarsi more or less infuscated, tegulæ stramineous, wings brownish; propodeum translucent, infuscated; abdomen stramineous ventrally, dorsally fuscous bordered with stramineous.

Male.—Length, 2 mm. Essentially as in the female, but considerably darker, the thorax mostly infuscated as are also the hind tibiæ.

Type.—Cat. No. 14317, U.S.N.M.

Type-locality.—Cuero, Texas.

Bred by M. M. High from *Psilocorsis* November 12, 1910. Received from Dr. F. H. Chittenden, Bureau of Entomology, United States Department of Agriculture.

One male shows an extra pair of furrows on the second dorsal segment near the lateral margin or about halfway between the median furrows and the outer edges of the segment.

APANTELES (PROTAPANTELES) COLEMANI, new species.

Female.—Length, 2 mm. Related to *Protapanteles creatonoti* Viereck, from the original description of which it differs as follows: Scape black, flagel blackish, labrum blackish; scutel dullish, apparently finely sculptured; tegulæ dark brown; radius, transverse cubitus, and third abscissa of cubitus stramineous, rest of veins almost colorless; coxæ black, proximal trochanters dark, middle femora dark at base, hind femora with the upper edge dark; propodeum mostly smooth and shining; first dorsal plate apparently one and one-half times as long as wide at base, black throughout, mostly sculptureless

and polished, indefinitely sculptured at apex; second plate apparently one and one-half times as long down the middle as wide at base, black throughout; third segment blackish throughout, part of venter stramineous, membranous portion of dorsum entirely blackish.

Type.—Cat. No. 14318, U.S.N.M.

Type-locality.—Vegati, Mysore, India, September 12, 1909, from larvæ of *Orgyia postica*, on authority of L. C. Coleman.

Named for Mr. L. C. Coleman.

APANTELES (PROTAPANTELES) CREATONOTI, new species.

Female.—Length, 2 mm. Black, shining; scape testaceous, flagel brownish, its joints near the apex distinctly longer than wide, labrum and palpi pale; head apparently wider than long; thorax not depressed, apparently as wide as thick dorsoventrally; scutel polished, almost impunctate; tegulæ stramineous; costa, stigma, radius, transverse cubitus, and third abscissa of cubitus, brownish, other veins mostly stramineous, wings transparent, with a dark tinge; legs, including coxæ and trochanters, almost completely stramineous, apical third of hind tibiæ and all of hind tarsi more or less brownish; propodeum indefinitely sculptured, without a median longitudinal carina; first dorsal plate apparently more than twice as long as wide at base and virtually twice as wide at base as at apex, punctured and black at apex, elsewhere mostly stramineous and polished; second plate apparently twice as wide at apex as at base, nearly as wide at base as long down the middle, polished, impunctate, testaceous to blackish; third dorsal segment apparently one and one-half times as long as the second, polished, impunctate, more or less stramineous laterally, dark down the middle; most of venter and membranous portion of abdomen stramineous; hypopygium extending a little beyond the pygidium ovipositor a little exerted.

Male.—Essentially as in the female.

Type.—Cat. No. 14319, U.S.N.M.

Type-locality.—Honalli, Mysore, India, July 10, 1910, from larvæ of *Creatonotus albistriga*, on authority of L. C. Coleman; two paratopotypes under date of September 6, 1910. Paratypes hale from Bangalore, from *Arctiid* larvæ, on authority of L. C. Coleman.

APANTELES (PROTAPANTELES) CUSHMANI, new species.

Male.—Length, 2 mm. Related to *Apanteles (Protapanteles) pholisorse* Riley, from which it differs as follows: Scape black, tegulæ black, coxæ black; propodeum coarsely rugose; first segment a little more than one and one-half times as long as wide at base, its apical half coarsely sculptured; second segment not much shorter than the third; the second plate transverse, nearly oblong, its sides curved, lateral edge of the membranous portion of the second segment pale; third

segment black, indistinctly sculptured at base; rest of abdomen black or blackish; abdomen depressed. In having the head apparently wider than long; in the first segment being wider at apex than at base and in the second plate of the abdomen being as wide or a little narrower at base than long down the middle, it agrees with *Apanteles* (*Protapanteles*) *pholisoræ* Riley.

Type.—Cat. No. 14320, U.S.N.M.

Type-locality.—Vienna, Virginia; bred July 31, 1911, from cocoons on grass by R. A. Cushman under Quaintance No. 7067, Bureau of Entomology, United States Department of Agriculture.

Named for Mr. R. A. Cushman.

APANTELES (PROTAPANTELES) ELECTRÆ, new species.

Female.—Length, 2.5 mm. Related to *Apanteles* (*Protapanteles*) *cushmani* Viereck, from which, as originally described, it differs as follows: Hind femora blackish-brown; stigma black; propodeum polished at base; first segment hardly one and one-half times as long as wide at base, its apical third punctured; second segment approximately two-thirds as long as the third, its plate trapezoidal, not sculptured down the middle, and apically transversely impressed, its sides straight anteriorly; third segment not at all sculptured at base; abdomen compressed and black or blackish throughout.

Male.—Essentially as in the female.

Type.—Cat. No. 14321, U.S.N.M.

Type-locality.—San Diego, California; bred from *Hemileuca electra*, May 20, 1911.

APANTELES (PROTAPANTELES) PAPILIONIS, new species.

Female.—Length, 2 mm. Related to *Protapanteles creatonoti* Viereck, from the original description of which it differs as follows: Propodeum almost without sculpture, mostly smooth and polished; first dorsal plate apparently twice as long as wide at base, its basal three-fourths parallel sided or nearly, indistinctly punctured and stramineous at apex; second plate apparently four times as wide at apex as at base, apparently twice as long down the middle as wide at base, stramineous; third segment hardly longer than the second; hypopygium shorter than the pygidium.

Male.—Essentially as in the female, but with the second plate mostly dark.

Type.—Cat. No. 14322, U.S.N.M.

Type-locality.—Mysore, India, June 29, 1909, from larvæ of *Papilio polytes*, on authority of L. C. Coleman.

Paratypes hale from Bangalore, from larvæ of *Papilio demoleus*, on authority of L. C. Coleman.

APANTELES (PROTAPANTELES) STAUROPI, new species.

Female.—Length, 2 mm. Head apparently wider than long; black, antennæ brownish, palpi pale; pleuræ not separated from the mesosternum by a carinate fold; scutellum shining, sparsely punctured; tegulæ blackish, wings with a dark cast, stigma and veins more or less brownish, legs mostly stramineous, coxæ black; propodeum roughened, with a more or less distinct median longitudinal carina; first dorsal plate appearing shorter than wide at apex, wider at apex than at base; its apical half mostly punctured, its basal half mostly impunctate; second plate transversely oblong, apparently two and a half times as wide at base as long down the middle, parallel sided, mostly smooth and not sculptured, with indefinite sculpture and a median welt; third dorsal plate not at all sculptured, a little longer than the second and like the latter with its lateral margins yellowish; hypopygium not surpassing the pygidium and ovipositor scarcely exerted.

Type.—Cat. No. 14323, U.S.N.M.

Type-locality.—Bangalore, Mysore, India, from larvæ of *Stauropus alternus*, on authority of L. C. Coleman.

As evidenced by one paratopotype, the sculpture of the first and second segments have a tendency to become totally effaced and the lateral edges of the second and third segments to become dark.

APANTELES (PSEUDAPANTELES) SESIÆ, new species.

Female.—Length, 3 mm. Related to *Apanteles (Pseudapanteles) consimilis* Viereck, from the original description of which it differs as follows: Membranous portion of second dorsal segment blackish, hind coxæ basally black, costa virtually concolorous with the stigma, all veins of fore wings brownish stramineous; propodeum mostly smooth and polished, sparsely punctured, roughened along the median carina, its lateral hind angles striate; first dorsal plate with its sides converging toward the apex, apparently wider at base than at apex, its length obviously more than twice its width at apex, the apical half with a median longitudinal furrow at base, the basal half finely sculptured and punctate, the apical half rather finely, indistinctly rugoso-punctate; second plate at most nearly three times as wide as long down the middle, the latter length about two-thirds its width at base, smooth and shining down the middle, roughened at base, elsewhere dullish and punctured; third segment hardly twice as wide at base as long down the middle, smooth and shining, with scattered indefinite pit-like impressions.

Male.—Essentially as in the female.

Type.—Cat. No. 14324, U.S.N.M.

Type-locality.—Vienna, Virginia, May 20, 31, 1911, parasite of *Sesia scitula*, on authority of R. A. Cushman, who reared the species

under Quaintance No. 7128, Bureau of Entomology, United States Dept. Agriculture.

One female paratopotype differs in being but 2 mm. long and in being less developed, especially in sculpture.

Family ICHNEUMONIDÆ.

AENOPLEGIMORPHA new genus.

Related to *Aenoplex* (Foerster) Ashmead, from which it may be distinguished by the bidenticulate anterior edge of the clypeus and by the petiolate abdomen, the first segment being somewhat more than three times as long as wide at apex, with prominently elevated spiracles and possessed of two dorsal, parallel, longitudinal carinæ and by the prominent thyridia at the base of the second segment. Has the appearance of a Phygadeuonine with an open, Hemiteline areolet.

Type.—*Aenoplegimorpha phytonomi*, new species.

AENOPLEGIMORPHA PHYTONOMI, new species.

Male.—Length, 4.5 mm. Black and shining; face sparsely, indistinctly punctured, clypeus almost impunctate; flagel 20-jointed; region of malar line sculptured; mandibles black throughout, palpi blackish; notauli extending approximately one-fourth the distance from the anterior to the posterior margin; dorsulum indistinctly punctured; tegulæ blackish, fore and midcoxæ blackish at base, becoming stramineous apically; distal trochanters, femora, tibiæ, and metatarsi of fore and midlegs more or less stramineous; rest of tarsi infuscated, as are the apical half of hind femora and base and apex of hind tibiæ; rest of hind femora reddish, remainder of hind tibiæ stramineous, hind coxæ entirely black; stigma blackish, whitish at base; propodeum distinctly areolated, the areas before the apical transverse carina smooth and polished, the areas beyond sculptured; second segment black and striate except apical fifth and the thyridia, which are rather smooth and reddish; third segment virtually sculptureless, reddish; fourth segment reddish at base; rest of dorsum of abdomen black.

Type.—Cat. No. 14325, U.S.N.M.

Type-locality.—Hoytsville, Utah. Reared from *Phytonomus murinus*, September 4, 1911, by T. H. Parks under Webster No. 5609, Bureau of Entomology, United States Department of Agriculture.

BRACHIXIPHOSOMA new genus.

Related to *Eiphosoma* Cresson, from which it differs chiefly in having the malar line shorter than the mandibles are wide at base and in the propodeum extending at least to the apex of the basal third of the hind coxæ.

Type.—*Eiphosoma pyralidis* Ashmead.

CONOBLASTA FUMIFERANÆ, new species.

Female.—Length, 7.5 mm. Very similar to *Glypta erratica* Cresson, from the original description of which it differs as follows: Front with a scoop-shaped process; mandibles black, clypeus pale only at apex, antennæ virtually black throughout; base of hind femora not blackish, hind tibiæ mostly black or blackish, pale beneath except at apex and near base, where they are blackish; propodeum almost devoid of carinæ, distinctly punctured, the apical transverse carina developed laterally, median longitudinal carina present only at base of propodeum.

Male.—Essentially as in the female; median longitudinal carinæ more or less completely developed, and the apical transverse carina better defined.

Type.—Cat. No. 14326, U.S.N.M.

Type-locality.—Maniwaki, Quebec, Canada.

Received through the same channels as the *Apanteles* (*Apanteles*) *fumiferanæ*, described on another page of this paper. Paratypes examined came from Duncans and Esquimault, British Columbia, Canada.

PHYGADEUON (DIROPHANES) PLESIUS, new species.

Female.—Length, 8 mm. Compared with the original description of *Phygadeuon* (*Bathymetis*) *spinicoxus* Viereck, this species differs as follows: Clypeus rather separated from the face by a shallow furrow; distance between lateral ocelli if anything a little less than that between the same and the nearest eye margin; antennæ 30-jointed, second joint of flagel about as long as the first; basal area nearly crowded out, nearly three times as wide as long, areola six-sided, almost horse-hoof shaped; hind femora hardly three times as long as greatest width; second dorsal segment without a transverse impressed line in the middle and with gastrocoeli; carinæ of basal segment extending to the spiracles, but not beyond, black; face, excepting clypeus, which is black, and checks mostly reddish; first eight joints of antennæ brownish, the next five joints mostly or entirely yellowish, the remaining joints from brownish to blackish; mandibles stramineous tinged with reddish and tipped with black; coxæ black tipped with brown, trochanters, mid and fore femora brown, more or less infuscated, hind femora black with reddish brown base and apex, tibiæ and tarsi more or less brownish, petiole and last three segments of abdomen more or less blackish.

Type.—Cat. No. 14327, U.S.N.M.

Type-locality.—Maniwaki, Quebec, Canada.

Received from the same source as *Apanteles* (*Apanteles*) *fumiferanæ*.

Bathymetis spinicoxus Viereck is probably also referable to this subgenus.

EPIURUS INNOMINATUS, new species.

Female.—Length, 7.5 mm. Compared with the original description of *E. nigrifrons* Viereck, this differs as follows: Ovipositor a little shorter than the abdomen; clypeus dark throughout; third, fourth, and fifth joints of hind tarsi dark, blackish; second, third, fourth, fifth, and sixth dorsal segments mostly reddish brown with an apical black border; pedicel and first joint of the flagel rather pale yellowish beneath, scape more or less brownish.

Type.—Cat. No. 14328, U.S.N.M.

Type-locality.—Esquimault, British Columbia, Canada.

Received through the same channels as *Apanteles* (*Apanteles*) *fumiferanæ* described on page 139 of this paper.

HYMENOEPIMECIS, new name.

Epimecis Brulle, 1846, not of Hubner, 1818.

HYMENOSYNECHES, new name.

Syneches Foerster, 1868, not of Walker, 1852.

MESOCHORUS DIVERSICOLOR, new species.

Female.—Length, 3.5 mm. Resembles *M. perniciosus* Viereck, from which it may be distinguished as follows: Furrow between face and malar space running parallel to the anterior edge of the clypeus, lower inner orbits rather striate; inner orbits with a whitish to brownish band extending along the eye margin, malar space and most of the mandibles whitish, clypeus brown to blackish, virtually impunctate except along its periphery; rest of the face blackish, as are the antennæ except the tip of the pedicel, which is yellowish; palpi stramineous, malar space whitish, rest of head mostly black or blackish; edges of prothorax more or less blackish, stigma not yellowish at base, areolet neither distinctly sessile nor distinctly petiolate; legs mostly stramineous, hind tibiæ with most of apical third fuscous; basal area longer than wide at base and triangular, costulæ joining the areola a little below the middle; first dorsal segment blackish, the second brownish with pale thyridia, the third brownish with the apical third blackish, the fourth and following segments blackish.

Male.—Differs from the female chiefly in the face being all whitish below the antennæ, scape and pedicel yellowish beneath, prothorax mostly yellowish, basal area at least twice as wide at base as at apex, costulæ joining the areola a little above the middle.

Type.—Cat. No. 14329, U.S.N.M.

Type-locality.—Duncan, British Columbia, Canada.

Reared July 18, 25, 1911, at the type-locality in connection with rearings of *Tortrix fumiferana*. Received by the Bureau of Entomology, United States Department of Agriculture, from Dr. C. Gordon Hewitt.

MICROTORIDEA, new genus.

Presumably related to *Microtorus* Foerster, from which it may be separated by the 10 penultimate joints of the flagel being longer than wide and by the marginal cell being longer than the stigma.

Type.—*Microtoridea lissonota*, new species.

MICROTORIDEA LISSONOTA, new species.

Female.—Length, 3 mm. Head black; face including clypeus distinctly pubescent, punctured, malar space smooth and polished, separated from the face by a furrow, rest of head polished; hind ocelli with a furrow between them, nearer the eye margin than to each other and apparently a little nearer to each other than to the occipital carina; malar line apparently a little longer than mandibles are wide at base; basal half of mandibles mostly yellowish, apical half mostly brownish; palpi pale; scape stramineous, pedicel and flagel more or less brownish, flagel 19-jointed; thorax black; pronotum with its transverse furrow almost crowded out in the middle by a rather broad process apparently extending back from the anterior edge; tubercles yellowish, propleuræ mostly polished; mesonotum polished, virtually bare, with distinct, converging notauli that extend nearly three-fourths the distance from the anterior edge and are nearly three times as far apart anteriorly as posteriorly; upper anterior corner of mesopleuræ, tegulæ, and wing base yellowish; mesopleuræ partly sculptureless, partly punctured, completely separated from the mesosternum by the sinuous sternaui; veins brownish, stigma stramineous; legs almost entirely stramineous, apical joint of tarsi and claws brownish; propodeum with its basal area almost crowded out, transversely linear, the enternal area and spiracular area confluent, the areola hexagonal, wider anteriorly than posteriorly, its anterior edge straight, its posterior edge arched, the costula joining before the middle, areola between the costulæ nearly three times as wide as long down the middle, area dentifera and second pleural area separated, petiolarea nearly three-fourths the length of the propodeum, concave and at most two-thirds as wide as long down the middle, third lateral and angular areas confluent; abdomen polished, inconspicuously pubescent, first segment black with a poorly defined dorsal carina on each side that extends a little beyond the spiracles but not near them, petiole depressed, apparently twice as broad at base as thick dorso-ventrally; postpetiole parallel sided, approximately twice as wide at apex as long, the spiracles at the anterior lateral angles; membranous portion of first segment and all of second segment mostly stramineous, following segments more or less testaceous; ovipositor approximately as long as the abdomen less the first segment.

Type.—Cat. No. 14330, U.S.N.M.

Type-locality.—Mysore, India, September 3, 1909, from *Ophiusa melicerta*, on authority of L. C. Coleman.

MONOBLASTUS CALIROÆ, new species.

Female.—Length, 5 mm. Related to *Monoblastus punctifrons* Davis, from the original description of which it differs as follows: Coxæ blackish or black basally, inclining to stramineous apically, trochanters stramineous, claws simple; wings blackish, stigma and veins blackish; front and clypeus rather indistinctly punctured, black.

Male.—Essentially as in the female, but with the scape pale beneath.

Type.—Cat. No. 14331, U.S.N.M.

Type-locality.—Vienna, Virginia, May 18, July 28, August 1, 1911, parasite of *Caliroa* (*Eriocampoides*) *cerasi* Linnæus, the pear slug, on authority of R. A. Cushman, who reared the specimens under Quaintance No. 7148, Bureau of Entomology, United States Department of Agriculture.

This species may prove to be *Trematopygus fusculosus* Davis.

NEOPIMPLOIDES, new genus.

Related to *Neopimpla* Ashmead, from which it may be distinguished by the slitlike spiracles of the propodeum and by the presence of an areolet; eyes distinctly emarginate above the middle.

Type.—*Neopimploides syleptæ*, new species.

NEOPIMPLOIDES SYLEPTÆ, new species.

Female.—Length, 8.5 mm. Mostly smooth, shining, thinly pubescent and yellow, ornamented with black spots; antennæ 37-jointed, flagel dark brown above, reddish beneath and at tips, its first joint nearly as long as the second and third joints combined, scape and pedicel yellow beneath, dark brown above; face feebly punctured; labrum prominent, in outline almost an equilateral triangle, concave; ocelli inclosed by a quadrate black mark; dorsulum similar to the same in *Theronia* Holmgren, the prescutum and parapsides each with a black mark; scutel completely bounded laterally by a trenchant carina, propodeum areolated, its basal area confluent with the areola, the combined area broader at apex than at base, petiolarea wider than long, hexagonal, area superoexterna open externally, with a dull blackish spot, area dentipara completely inclosed, other areas all wanting; empodia virtually as long as the third joint of hind tarsi, claws falcate; alternate segments of the abdomen starting with the first with a black spot on each side; wings transparent with a smoky tinge.

Type.—Cat. No. 14332, U.S.N.M.

Type-locality.—Malebannur, Mysore, India. Reared from *Sylepta derogata* Fabricius, November 28, 1910, on authority of L. C. Coleman, who furnished the type.

PRISTOMERUS EUZOPHERE, new species.

Female.—Length, 7 mm. Head and thorax brownish to stramineous; face shining and punctured; thorax shining and punctured, parapsidal furrow represented only anteriorly by a shallow concavity; legs more or less stramineous, the hind tibiæ infuscated at base and on the apical half, hind tarsi blackish, tooth of hind femora represented by an angulation of the tegument the point of which is directed downward and backward; carinæ of the propodeum poorly developed, basal area forming an acute angled triangle, areola completely inclosed, more than twice as long as wide from costula to costula and punctured, basal area about twice as long as wide, parallel sided and striato-punctate; abdomen brownish, the membranous portion stramineous, first, second, and basal half of third dorsal segments blackish, petiolar carinæ not sharp, not extending to the spiracles, postpetiole and second dorsal segment finely striated; ovipositor approximately two-thirds as long as the abdomen.

Type.—Cat. No. 14333, U.S.N.M.

Type-locality.—Bangalore, Mysore, India. Reared from larvæ of *Euzophera perticella*, on authority of L. C. Coleman, who submitted the species for study.

ZAMESOCHORUS, new genus.

Apparently intermediate between *Plesiophthalmus* (Foerster) Brischke, *Astiphromma* (Foerster) Brischke, and *Mesochorus* Gravenhorst, though evidently nearest to the last-mentioned genus, from which it may be known by the malar space being almost wanting, the malar line being apparently as short or shorter than the first joint of the flagel is thick; by the malar space not being separated from the face by a furrow; by the distance between the lateral ocelli and the eye being less than the shortest diameter of the lateral ocelli; by the distance between the lateral ocelli being greater than the distance between them and the eye; by the interstitial nervulus and the obsolescent outer vein of the areolet, the latter with its lowerside approximately half the length of the upper edge, its other sides nearly equal in length. Otherwise essentially as in *Mesochorus* Gravenhorst.

Type.—*Zamesochorus orientalis*, new species.

ZAMESOCHORUS ORIENTALIS, new species.

Female.—Length, 3.5 mm. Head shining, stramineous, more or less darkened, the ocellar region blackish; face punctured, orbits striated below; antennæ brownish, flagel 33-jointed; prothorax stramineous, shining, pronotum with a median longitudinal carina parting its furrow; mesonotum shining, more or less stramineous, its prescutum and parapsides stained with fuscous; tegulæ and wing

bases yellowish, mesopleuræ blackish, shining and punctured; scutellum stramineous; stigma and veins mostly brownish; legs stramineous, hind tibiae with the apical fourth blackish; propodeum blackish, shining, finely punctured; basal area quadrangular, wider at base than at apex; areola hexagonal, almost diamond-shaped, a little wider at apex than at base, the costulae joining it at its middle, petiolare apparently a little longer than the areola and about twice as wide as the same, at least three times as wide at apex as at base; petiole but little longer than the postpetiole, stramineous at base, blackish beyond, gradually widened, sparsely sculptured; postpetiole blackish, longitudinally striated, a little narrower at base than at apex, distance between the spiracles approximately half the distance between them and apex; second segment proportionally similar to the postpetiole, with a triangular blackish area on each side, the shortest side of the triangle being at the base of the segment, otherwise the second segment is yellowish, the gastrocoeli oval, at base, and stramineous; basal half of third segment yellowish; rest of abdomen infuscated stramineous; sheaths of the ovipositor a little longer than the second segment and stramineous; hypopygium exerted beyond the pygidium.

Type.—Cat. No. 14334, U.S.N.M.

Type-locality.—Mysore, India, September 3, 1909, from *Ophiusa melicerta*, on authority of L. C. Coleman.

SYSTEMATIC NOTES AND DESCRIPTIONS OF SOME WEEVILS OF ECONOMIC OR BIOLOGICAL IMPORTANCE.

By W. DWIGHT PIERCE,

Of the Bureau of Entomology, United States Department of Agriculture.

1. THE MORE IMPORTANT COTTON WEEVILS.

The discovery of a new cotton-square weevil in Peru and of a cotton flower weevil in the Philippines makes it necessary for us to again resort to the older name of Mexican cotton-boll weevil for *Anthonomus grandis* Boheman. The weevil from Peru, *Anthonomus vestitus* Boheman, may be known as the Peruvian cotton-square weevil, and the new Philippine weevil may receive the name of Philippine cotton flower weevil.

ANTHONOMUS GRANDIS Boheman.

The Mexican cotton-boll weevil is well known on account of the great amount of literature written upon it. It is a blackish piceous weevil with gray pubescence and without distinct patterns, except a denser band of scales on the median line of the thorax. The vestiture of the under surface is much denser than that of the upper surface. The femora have two teeth, a large one and a small one. The pygidium is rather freely exposed. The funicle is 7-jointed, the second joint being longer than the third. The claws are armed with a long slender tooth. The ventral segments are slightly unequal, the fifth being generally longer than either the third or fourth. It varies in size from 2.5 mm to 6.7 mm., and the color of the vestiture varies from gray to brownish, while the integument varies from light piceous to black.

The pupæ of *Anthonomus grandis* are readily recognized by the quadrate tubercles on the prothorax and the shape of the caudal process.

ANTHONOMUS VESTITUS Boheman.

The Peruvian cotton-square weevil has just appeared in our economic literature,¹ and again Mr. C. H. T. Townsend is the

¹ Charles H. T. Townsend. The cotton-square weevil of Peru and its bearing on the boll-weevil problem in North America. *Journal of Economic Entomology*, vol. 4, No. 2, pp. 241-248, April 17, 1911.

first to give a preliminary treatment of its life history. His early contribution to the knowledge of the boll weevil is noted for its thoroughness, and it is therefore a matter of congratulation that Mr. Townsend is in a position to take up the study of this weevil which may have a bearing upon future work with its greater congener.

A series of 67 specimens bred from cotton squares on the Hacienda Macacará in the Rio Chira Valley, Peru, October 8, 1910, by Mr. Townsend, and 1 specimen from San Pedro de Cumbivira, Peru, September 21, 1910, are before the writer. The series is composed of 38 females and 30 males. The males vary from 3 to 4 mm. in length, 1.4 to 1.8 mm. in width, and 1.2 to 1.5 mm. in length of beak. The females vary from 2.5 to 4 mm. in length, 1.2 to 1.75 mm. in width, and 1.2 to 1.7 mm. in length of beak.

The San Pedro specimen is darker than the others and most nearly answers the description by Boheman which must have been based on a female. The following description is therefore based upon this specimen:

Female.—Oblong-ovate, convex, blackish piceous, rather closely clothed with whitish, elongate scales, which are more piliform beneath. Head convex, finely punctate, moderately squamose, front depressed, with medium carina between eyes extending on beak to the point opposite the attachment of the antennæ. Beak slender, cylindrical, shining, finely punctato-rugulose, lightly squamose only at base, reddish piceous, lightly arcuate, slightly enlarged at tip, over one and one-half times as long as prothorax. Antennal scrobes directed at eyes; scape inserted slightly beyond the middle, slender, clavate, barely reaching the eye, reddish testaceous; funicle seven jointed, reddish testaceous, first joint as long as the two following, clavate, second joint elongate, remaining joints moniliform; club ovate, blackish piceous, with first joint very distinct, pubescence fine. Prothorax transverse, apically truncate, basally bisinuate, base one-half wider than apex, sides convex, converging, impressed before apex; dorsum slightly convex, transversely impressed behind apex, densely but shallowly punctate, clad with elongate white scales. Scutellum broadly ogival, clad with very fine piliform scales. Elytra anteriorly subtruncate, about one-half wider than thorax, a little over twice as long as the thorax, sides almost parallel to posterior third, thence converging, surface convex, regularly punctato-striate, interstices subconvex, smooth; closely covered with scaly vestiture. Body beneath of same color as above, but more densely clothed with finer vestiture. Femora clavate, unidentate, basally flavo-testaceous, the remainder infuscated, squamose; tibiæ slender, flavo-testaceous, almost straight, angulate beneath before middle; tarsi elongate; claws elongate,

cleft. Ventral segments subequal, the fifth slightly longer than third or fourth. Pygidium covered.

This description varies in a few slight particulars from the original,¹ but I do not believe sufficiently to separate it as a new species. The bred specimens from Macacará differ considerably in superficial appearance. They are all lighter in color. The median interstices of the elytra and a triangular area at the base of the elytra are blackish piceous, and the remainder is a reddish piceous. The beak is dark; the legs have practically no infuscation. The pubescence is yellowish and a little denser because less rubbed, and there is a distinct pattern of the vestiture. The thorax has a light median band and lighter sides; the elytra have a dark triangular basal area, a triangular lateral area on each side about the middle, a small basal spot and two small subapical spots. These spots are merely due to the sparser vestiture and are indistinct on the maturer specimens.

The sexes are readily distinguished. The female beak is slender, quite smooth, has very little pubescence at the base, is regularly but slightly arcuate and has the scape inserted slightly beyond the middle; the pygidium is rarely visible, apically narrowly truncate and pubescent only at apex; the posterior tibiæ are almost straight, the angle opposite the femoral tooth being almost obsolete. The male beak is stouter, more strongly punctato-rugose, pubescent to the insertion of the antennæ; scape inserted almost at apical third; beak arcuate at point of insertion of antennæ; the pygidium is usually visible, broadly truncate at apex and pubescent except in narrow strip

¹ The original description is as follows:

Anthonomus vestitus Boheman.

Oblongo-ovatus, convexus, nigro-piceus, squamis piliformibus, cinereis dense vestitus; antennis pedibusque flavo-testaceis; femoribus clavatis, subtus unidentatis, apice late infuscatis; rostro prothorace fere duplo longiore, leviter arcuato; prothorace subconico, confertim punctulato; elytris ferrugineis, medio-criter punctato-striatis, interstitiis sub-convexis, lævibus.—Long. 34, lat. 2 millim.

Patria: Insula Puna.

A. *Utmæ* magnitudine æqualis. Caput parvum, rotundatum, modice convexum, nigro-piceum, subtiliter, crebre punctulatum, squamis setiformibus cinereis dense vestitum. Oculi parvi, rotundati, convexi, nigri. Rostrum prothorace fere duplo longius, tenue, cylindricum, leviter arcuatum, piceum, punctulatum, apice dilutius, basi parce cinereo-squamosum, leviter longitudinaliter carinatum. Antennæ ad medium prothoracis pertingentes, tenues, pallide testaceæ, clava ovata, fusca, cinereo-pubescente. Prothorax latitudine postica brevior, apice truncatus, antè angustior, pone apicem oblique, dein basin versus parum ampliatus, basi bisinuatus, superne convexiusculus, nigro-piceus, crebre punctulatus, squamis piliformibus cinereis dense vestitus. Scutellum parvum, dense cinereo-squamosum. Elytra antice subtruncata, prothorace dimidio latiora et duplo longiora, humeris parum elevatis, rotundatis; lateribus inflexa, ultra medium perparum ampliata, apice conjunctim rotundata, superne convexa, postice declivia, medio-criter, regulariter punctato-striata, interstitiis sub-convexis, lævibus; ferruginea, squamis piliformibus cinereis dense obsita. Corpus subtus nigro-piceum, punctulatum, dense cinereo-squamosum. Pedes longiusculi, flavo-testacei, cinereo-squamulosi; femoribus clavatis, basi excepta, infuscatis, subtus: ante apicem dente parvo, acuto armatis; tibiis teretibus, sub-rectis. Kongliga Svenska Fregatten *Eugenies* Resa Omkring Jorden under befäl C. A. Virgin Åren 1851-1853. Vetenskapliga iakttagelser På H. Maj. t Konung Oscar den Förstes befäling utgifna af K. Svenska Vetenskaps-Akademien. Zoologi, III. Text: Insekter p. 130, No. 273, Stockholm, 1859.

at base; the posterior tibiæ are straight, but inner edge is regularly emarginate in the median third.

The species belongs to a group not represented in North America, but would rank near the artificial group *Cnemocyllus* Dietz, because of the dissimilarity of the hind tibiæ in the two sexes.

ECTHETOPYGA, new genus.

Name derived from *ἐκθετος* (exposed) + *πυγή* (pygidium).

The following genus belongs in Lacordaire's classification to Curculionides Phanérognaethes Apostasimérides, Phalange I, Section A, Tribu Ménémachides, Groupe Ménémachides vrais. In our modern classification it seems to belong to subfamily Menemachinæ, Tribe Menemachini.

Female.—Beak about as long as thorax, cylindrical, arcuate; scrobes beginning at apical fifth, arcuate and directed at eyes. Antennæ moderately slender; scape attached slightly behind the middle of beak, hardly reaching eyes; funicle with first joint elongate, twice as long as second joint, which is only slightly longer than the third, joints 3-7 short, obconical, increasing in breadth; club very little wider than seventh funicular joint, oblong oval, articulated, the first joint occupying about one-half of the mass, second and third very short. Eyes large, convex, almost round, separated by two-thirds the width of the beak below and by the width of the beak above. Prothorax transverse, slightly convex, sides straight to middle, then roundly narrowed to apex, minutely constricted before apex, base outwardly convex, apex barely half as wide and truncate. Scutellum triangular, roundly truncate at apex, inserted between the elytra. Elytra very slightly convex, oblong, about twice as long as wide, rounded at humeri, and at external, and sutural apical angles; widest near base, slightly wider than prothorax. Pygidium exposed, horizontal, almost flat, evenly rounded behind. Legs moderately robust; femora strongly enlarged, each armed with a large triangular tooth; tibiæ shorter than femora, apically enlarged, compressed, basally arcuate, apically mutic; tarsi moderate, first two joints small, transverse; third longer, bilobed; fourth slender, half included between the lobes of the preceding; claws basally strongly toothed, slender, diverging. Prosternum convex, long in front of coxæ; coxæ globular, distinctly but very narrowly separated, cavities closed behind. Mesosternum transversely strongly depressed in front of coxæ, side pieces large; coxæ rather widely separated, open behind, the intercoxal pieces truncate. Metasternum flat, median longitudinal suture distinct; episterna large; coxæ separated by transverse arcuate piece, cavities open behind. Intercoxal process of first abdominal segment broad, convex in front. First and second abdominal segments large,

connate, the suture slightly arcuate and indicated by a smooth line; remaining segments shorter, the fourth being shortest.

Male.—The male generic characters differ as follows: Beak more robust, slightly shorter, almost straight; scrobes beginning at apical fourth, straight, and directed at eyes. Antennal scape inserted at or slightly beyond middle of beak, reaching eyes; eyes separated by about one-half the width of the beak below and by slightly less than the width of the beak above. Pygidium arcuately truncate at apex. First two abdominal segments connate, suture angulate at middle.

Genotype.—*Ecthetopyga gossypii*, new species.

ECTHETOPYGA GOSSYPIL, new species.

Described from three females and two males taken from a series collected by C. S. Banks on cotton plants from the island of Negros, Philippine Islands (Banks No. 883).

Length, 3–3.5 mm.; breadth, 1.75 mm. Broadly oval, compressed, truncate behind. Color dark brown, with fine golden pubescence, head and beak almost black, underside lighter brown, legs and antennæ still lighter.

Female.—Beak evenly sculptured with oblong punctures, not pubescent. Front with a short longitudinal fovea; finely, evenly punctured, finely pubescent between eyes. Prothorax finely, closely, and evenly punctured and pubescent. Elytral striæ consisting of deeper close-set punctures, but not depressed; intervals closely, finely, and evenly punctured. Underside lighter throughout, punctuation and pubescence sparser. Coxæ and legs yellowish, punctured and pubescent; femoral teeth about equal; tarsi spongy underneath; tarsal claws moderately large, slender, strongly divergent, basally toothed.

Male.—Beak flattened, apically enlarging, laterally and medially tricarinate, rugosely oblongo-punctate. Front foveate.

In form this species resembles very much *Miarus* and *Gymnetron*, but the antennal and unguinal characters readily separate it. No nearly related American species are known.

Type.—Cat. No. 14469, U.S.N.M.

2. THE CACTUS WEEVILS.

In view of the approaching publication of a bulletin on cactus insects by W. D. Hunter, J. D. Mitchell and the late F. C. Pratt, the writer has been requested to make a critical study of the cactus weevils formerly grouped under the genus *Acalles*. In view of the description of another species in the same subtribe, it is pertinent to present herewith a table of the genera of the subtribe Tylodina, in the subfamily Cryptorhynchinae now known to occur in the United States.

Key to genera of subtribe *Tylodina*.

Metepisterna very small, usually invisible, not fused with metasternum.

1. Scutellum invisible.

a¹. Elytra without humeri; antennal funicle 7-jointed.

b¹. Second ventral segment at least as long as the third and fourth together.

c¹. Second ventral segment considerably longer than third and fourth together; femora mutic; eyes separated by at least the width of the beak; vestiture spongy; prothorax prolonged over head; ocular lobes very prominent, covering eyes (type, *L. solitarius* Boheman). . . . *Lembodes* Schönherr.

c². Second ventral segment not much longer than the third and fourth together; femora mutic; eyes separated by the width of the beak (type, *T. armadillo* Sahlberg). . . . *Tylodes* Schönherr.

b². Second ventral segment not as long as the third and fourth together.

d¹. Second ventral segment much longer than either the third or fourth; tarsal claws very small, approximate.

e¹. Antennal club annulated only near tip; first abdominal segment with deep, polished triangular impression; tibiae straight; intercoxal process of abdomen triangular (type, *E. pyriformis* LeConte).

..... *Eurhoptus* LeConte.

e². Antennal club annulated; elytra 9-striate; first abdominal segment squarely truncate behind; at least front tibiae bisinuate within; eyes separated at least by width of beak; intercoxal process truncate; scales intermixed with bristles (type, *A. camelus* Fabricius).

..... *Acalles* Schönherr.

d². Second and third ventral segments subequal; femora unarmed; eyes rounded above, acute beneath, closer together than width of beak; scrobes directed at lower corners of eyes; scales not intermixed with bristles (type, *G. bifasciata* Gerstæcker). . . . *Gerstæckeria* Champion.

a². Elytra with rectangular humeri; funicle 7-jointed.

f¹. Eyes separated by width of beak; femora dentate; scales intermixed with bristles; second ventral segment longer than either the third or fourth (type, *E. porcellus* Boheman).

..... *Euscepes* Schönherr.

f². Eyes separated by less than width of beak; femora usually dentate; ventral segments 2-4 subequal; elytral vestiture not mixed with erect setæ; scutellum sometimes visible (type, *P. bicristatus* Champion). . . . *Pseudomopsis* Champion.

2. Scutellum visible; funicle 7-jointed; ventral segments 2-4 subequal; elytra 10-striate; femora mutic; claws divergent; humeri absent (type, *P. notatus* Schönherr). . . . *Pseudomus* Schönherr.

Genus GERSTÆCKERIA Champion.

All of the cactus weevils at present known belong to this genus. The type is *Acalles bifasciatus* Gerstæcker. A close study of the material in the United States National Museum leads the writer to divide the genus into four subgenera or species groups.

Key to subgenera.

1. Elytra with a post-humeral prominence; eyes well separated; femora unarmed.

a¹. Antennæ inserted toward the apex of the beak (type, *X. inflata* Champion).

..... *Xenosomina*, new subgenus.

a². Antennæ inserted at middle of beak; scrobes directed beneath beak; scape short, not reaching eyes; tarsal claws minute, parallel (type, *O. hubbardi* LeConte). . . . *Opuntiaphila*, new subgenus.

2. Elytra without post-humeral prominence; eyes narrowly separated; femora unarmed.

b¹. Third tarsal joint scarcely wider than the second; alternate interspaces of elytra more densely scaly; prothorax carinate; tarsal claws large, divergent (type, *G. bifasciata* Gerstaecker).....*Gerstaeckeria*, sens. str.

b². Third tarsal joint obviously wider than second; alternate interspaces not more densely scaly (type *P. nobilis* LeConte).....*Philopuntia*, new subgenus.

XENOSOMINA, new subgenus.

Xenosomus CHAMPION, Biol. Centr.-Amer., Coleoptera, vol. 4, pt. 4, p. 469.

The characterization of this subgenus and designation of type are included in the table to subgenera, preceding.

Key to species.

1. Elytra strongly nodulose, subglobose; prothorax strongly constricted, *inflata* Champion.
2. Elytra feebly nodulose, less globose; prothorax less strongly constricted, *turpis* Champion.

GERSTAECKERIA (XENOSOMINA) INFLATA Champion.

This species is recorded from San Gerónimo, Guatemala.

GERSTAECKERIA (XENOSOMINA) TURPIS Champion.

This species is recorded from Cerro Zunil, Guatemala.

Nothing is known of the habits of these species. They were included by Champion in Fausts' genus *Xenosomus*, but differ in several respects from that genus. They may possibly merit generic rank.

OPUNTIAPHILA, new subgenus.

The characterization of this subgenus and designation of type are included in the table to subgenera, preceding.

Key to species.

1. Elytral foveae isolated and rounded*hubbardi* LeConte.
2. Elytral foveae coalescent.....*dilatata* Casey.

It is the writer's opinion that Colonel Casey's species is merely a sculptural variant of *hubbardi*, which is quite variable in the development of its humeral tubercles. Both species are strongly marked with white post-humeral and post-median transverse bands.

GERSTAECKERIA (OPUNTIAPHILA) HUBBARDI LeConte.

This species was found by H. G. Hubbard breeding in the joints of *Opuntia vulgaris* following injury by *Melitara prodenialis* Walker. The species is at hand from Crescent City and Lake Worth, Florida, and from Selma, Alabama.

GERSTAECKERIA (OPUNTIAPHILA) DILATATA Casey.

This species is described from Florida.

GERSTÆCKERIA, sens. str.

The characterization of this subgenus and designation of type are included in the table to subgenera, preceding.

Key to species.

1. Elytra tessellate; body robust..... *tessellata*, new species.
2. Elytra fasciate.
 - a¹. Elytra oval; prothorax as long as wide.
 - b¹. Femora mottled on basal two-thirds, white on apical third; elytral fasciæ irregular..... *profusa* Casey.
 - b². Femora covered with golden white scales, the middle and hind pairs with a dark band before the apex; elytral fasciæ regular..... *bifasciata* Gerstæcker.
 - a². Elytra inflated; prothorax wider than long; femora covered with dark scales, speckled with white, with a white ring before the apex, apex black, *alternata*, new species.

GERSTÆCKERIA (GERSTÆCKERIA) TESSELLATA, new species.

Cheyenne, Wyoming, April 24, Soltau collection (two specimens).

Length, 7.5–8 mm. Black; legs piceous-black; scaly vestiture black and yellowish-white, tessellated. Beak long, densely rugosely punctate, carinate. Front longitudinally sulcate; eyes separated by about one-half the width of the beak. Head and basal third of beak clothed with yellowish scales. Prothorax as long as wide, strongly carinate, widest at middle, strongly constricted at apex; strongly, reticulately or confusedly punctate, the punctures largest at base and sides, smallest at apex; vestiture extremely sparse. Elytra wider at base than prothorax, oval; alternate elytral interspaces slightly wider and much more densely clothed; stria punctures large, quadrate, each bearing a small quadrate scale, separated by partitions not as high as the interspaces; vestiture consisting of white and black tessellations. Femora clothed with brown scales with a white band before apex; tibiae clothed with white. Femora unarmed; tarsal claws widely divergent. Venter moderately punctate, clothed with light and dark scales; second ventral segment slightly longer than third or fourth.

There is also at hand one specimen labeled Colorado Springs, Colorado, June 15–30, 1896, H. F. Wickham, 6,000 to 7,000 feet.

Type.—Cat. No. 14470, U.S.N.M.

GERSTÆCKERIA (GERSTÆCKERIA) PROFUSA Casey.

Texas, Belfrage and Soltau collections (five specimens).

No records of the habits of this species can be found.

GERSTÆCKERIA (GERSTÆCKERIA) BIFASCIATA Gerstæcker.

This species was described from Mexico. It is recorded in the Biologia Centrali-Americana from Zimapan in Hidalgo. Ehrenberg found it in numbers on Cactus.

Four specimens were bred November 1, 1910, from *Echinocactus setispinus*, collected in June at San Antonio, Texas, by F. L. Lewton.

GERSTÆCKERIA (GERSTÆCKERIA) ALTERNATA, new species.

Fort Grant, Arizona, July 15, Hubbard and Schwarz (two specimens).

Length, 10 mm. Black; antennæ and legs piceous; scaly vestiture mottled black, piceous brown, and whitish. Beak long, densely rugosely punctate, carinate. Front longitudinally sulcate; eyes separated by about one-half the width of the beak; head and basal fourth of beak densely clothed with creamy-white and light-brown scales with a chocolate-brown patch over each eye. Prothorax a little wider than long, medially carinate, widest behind middle, strongly constricted at apex; strongly reticulately or confusedly punctate, the punctures becoming smaller and shallower toward apex; clothed with piceous scales with a few scattered whitish and light-brown dots. Elytra not wider at base than prothorax, but almost twice as wide as prothorax from basal fourth to apical fourth; alternate elytral interspaces slightly wider and much more densely clothed; stria punctures large, quadrate, shining, each bearing a piceous scale and separated by partitions not as high as the interspaces; vestiture mainly composed of tessellations of black and piceous-black scales with an occasional light-brown scale and with a definite post-humeral spot of white and brown and an irregular transverse white fascia just before the apical declivity; declivity more strongly marked with brownish scales. Femora strongly mottled with chocolate, brown and white, but with definite white subapical bands; tibiae clothed with white, but with base and apex dark. Femora unarmed; tarsal claws long and slender and strongly divergent. Venter moderately punctate, clothed with chocolate-colored scales with pale longitudinal bands on each side and in the middle. Second segment slightly longer than third or fourth.

Type.—Cat. No. 14471, U.S.N.M.

PHILOPUNTIA, new subgenus.

The characterization of this subgenus and designation of type are included in the table to subgenus, preceding.

Key to species.

1. Elytra with a very evident white cruciform or T-shaped post-median fascia.
 - a¹. Prothorax carinate (see also *fasciata* Pierce).
 - b¹. Beak sparsely punctate, except at base; elytral intervals narrow; stria punctures coarse.
 - c¹. Length 5 mm..... *leseleruci* Champion.
 - c². Length 8 mm..... *lacti* Champion.
 - b². Beak strongly punctate throughout; elytral intervals broad; femora dark, annulate with golden brown..... *nobilis* LeConte.
 - a². Prothorax not carinate; beak closely and coarsely punctate; elytral intervals broad; femora annulate..... *cruciata* Champion.

2. Elytra without an evident white cruciform post-median fascia.

d¹. Prothorax trisulcate at base.e¹. Vestiture variegated with larger white scales above.*curvilineata* Champion.e². Vestiture without white scales above.....*tolucana* Champion.d². Prothorax not trisulcate at base.f¹. Prothorax more or less transverse.g¹. Elytra clothed with brown and black scales with prominent spot of black scales at middle of fourth interspace.*lineatocollis* Champion.g². Elytra otherwise clothed.h¹. Prothorax comparatively small; elytra at least one-half wider; claws at least moderately divergent.i¹. Elytra black with brownish basal spot and post-median vitta; sutural intervals apically brownish.....*basalis* LeConte.i². Elytra without basal spots but sometimes with faint post-humeral vitta and more or less distinct post-median vitta.j¹. Length 6-7 mm.....*porosa* LeConte.j². Length 4 mm.....*clathrata* LeConte.h². Prothorax large, about as wide as elytra.k¹. Elytral interspaces wide.l¹. Claws slender and widely divergent; beak rugosely punctate and carinate; elytra with post-humeral and post-median fasciæ.....*opuntiae*, new species.l². Claws small and approximate; beak rather short, very finely punctate, not carinate; elytra with post-sutural spot and post-median brownish T-shaped fascia; punctures shallow.....*fasciata*, new species.k². Elytral interspaces rather narrow; claws moderately divergent; beak short, punctate; elytra mottled, and with strong humeral spots and post-median fascia.*cactophaga*, new species.f². Prothorax distinctly longer than wide.....*turbida* LeConte.

GERSTÄCKERIA (PHILOPUNTIA) LESELEUCI Champion.

Vera Cruz, Mexico; Juquila (Oaxaca), Mexico (Champion).

GERSTÄCKERIA (PHILOPUNTIA) LACTI Champion.

Campeche (Yucatan), Mexico (Champion).

GERSTÄCKERIA (PHILOPUNTIA) NOBILIS LeConte.

Described from the Boll and Belfrage collections, Texas. Breeds in the lateral margins of the joints of *Opuntia engelmanni* and causes great masses of black excrement and gum to form on the outside of the joint. It has been taken at College Station, Victoria, Beeville, San Antonio, Floresville, Encinal, Hondo, Corpus Christi, and Live Oak County, Texas.

GERSTÄCKERIA (PHILOPUNTIA) CRUCIATA Champion.

Toxpan (Vera Cruz) and Mexico City, Mexico (Champion).

GERSTÆCKERIA (PHILOPUNTIA) CURVILINEATA Champion.

This species is described from Mexico (Champion).

GERSTÆCKERIA (PHILOPUNTIA) TOLUCANA Champion.

This species is described from Toluca, Mexico (Champion).

GERSTÆCKERIA (PHILOPUNTIA) LINEATOCOLLIS Champion.

This species is described from Sierra de Durango, Mexico (Champion).

GERSTÆCKERIA (PHILOPUNTIA) BASALIS LeConte.

This species is described from Colorado. Specimens are at hand from Denver, Greeley, Cañon City, and Sedalia, Colorado, and Cheyenne, Wyoming. Specimens were taken on *Opuntia* in Sioux County, Nebraska, by Dr. R. H. Wolcott.

GERSTÆCKERIA (PHILOPUNTIA) POROSA LeConte.

This species is either very variable in color markings or else there is a large number of extremely closely related species, which at present the writer prefers to call geographical races. Specimens are at hand from Kansas; Denver, Colorado Springs, and Sedalia, Colorado; Albuquerque and Mesilla Park, New Mexico; Fort Grant, Arizona; San Diego, Floresville, Live Oak County, D'Hanis, and Hondo, Texas. The species breeds in flat cells in the large flat-leaved *Opuntias*.

GERSTÆCKERIA (PHILOPUNTIA) CLATHRATA LeConte.

This species was described from Colorado. It is at hand from Colorado Springs, Colorado; Santa Rita Mountains, Arizona; San Diego, Laredo, Hidalgo, Uvalde, and Brownsville, Texas. The species breeds in the stem of *Opuntia leptocaulis* and is sometimes so numerous that it causes great buncchy deformations of growth.

GERSTÆCKERIA (PHILOPUNTIA) OPUNTIE, new species.

Encinal, Texas, April 10, 1908, under *Opuntia*, J. D. Mitchell (two specimens).

Length, 6 mm. Black, with antennæ and legs piceous-black; vestiture consisting of white, yellowish, and brownish scales. Beak shining, carinate, strongly, rugosely punctate; front sulcate, eyes separated by one-half the width of the beak. Head and base of beak clothed with white scales, which are a little darker at vertex. Prothorax large, transverse, strongly convex, much narrowed to apex, shining, deeply and closely punctate; vestiture brown, with a few scattered paler scales. Elytra oval, barely one-third wider than prothorax; stria punctures large, round, squamigerous, rather shallow;

interspaces wide; vestiture mainly brown, with a paler subbasal and a postmedian fascia, and with sutural interspaces lighter brown. Femora indistinctly annulate; claws slender, divergent. Venter moderately, shallowly punctate, sparsely clothed; second segment a little longer than third or fourth.

Specimens are also at hand from Encinal, Texas, April 18, 1906, J. D. Mitchell.

Type.—Cat. No. 14472, U.S.N.M.

GERSTÆCKERIA (PHILOPUNTIA) FASCIATA, new species.

Buck Key, Florida, G. Brainard (one specimen).

Length, 5.5 mm. Black, antennæ rufous; legs piceous-black; vestiture white, golden, and brown; beak moderately long, shining, finely punctate, not carinate; front strongly foveate; eyes separated by one-half the width of the beak; head clothed with golden or cream-colored scales. Prothorax large, sides strongly convex, rather shallowly punctate with smooth spots on sides; median line impunctate; vestiture golden, with a few white dots. Elytra inflated at basal third, thence tapering to apex, not one-half wider than prothorax; stria punctures large, very shallow, interspaces as wide as punctures; vestiture golden, condensed at base of third interspace, also on the apical half of sutural interspace and in a transverse postmedian vitta crossing this; prominent spots of white scales behind humeri on fourth to seventh interspaces; brown scales bordering fasciæ. Femora annulate; tarsal claws approximate; venter clothed with golden scales.

Type.—Cat. No. 14473, U.S.N.M.

GERSTÆCKERIA (PHILOPUNTIA) CACTOPHAGA, new species.

Point Isabel (near Brownsville), Texas, May 11, 1904, H. S. Barber (four specimens).

Length, 6 mm. Black, antennæ brownish, legs piceous-black; vestiture whitish, yellowish, and brown. Beak short, shining, punctate, carinate. Front sulcate; eyes separated by one-half the width of the beak. Head and basal half of beak densely clothed with whitish scales. Thorax as in preceding species, but with a median longitudinal white stripe at base and four white dots on the apical half arranged in a square in the line with the eyes. Elytra very little wider than prothorax, interspaces narrow, punctures round, moderately deep; vestiture piceous, but with large humeral brown spots more or less connected across entire base by light scales, and with a wavy white postmedian fascia and with declivity more or less marked with light scales; sutural interspace light brown. Femora annulate, mutic; tarsal claws divergent. Venter clothed with light-brown scales.

Type.—Cat. No. 14474, U.S.N.M.

GERSTÆCKERIA TURBIDA LeConte.

Specimens are on hand from Tucson, Catalina Springs, and Fort Grant, Arizona, all from the Hubbard and Schwarz collection.

3. MISCELLANEOUS NEW SPECIES OF BIOLOGICAL INTEREST.

The three following species are described in this paper because of their being associated with known plants, which, of course, makes them more interesting. They are also very interesting species in themselves, the last two representing new genera for our United States fauna.

ANTHONOMUS MLEPHONUS, new species.

Name derived from *μαῖφνος*, blood-stained.

Described from a series of six specimens collected June 22, 1894, at Round Knob, North Carolina, from the Hubbard and Schwarz collection, beaten from bushes of mountain laurel (*Rhododendron*).

This species belongs to the *signatus* group near *sulcifrons* and *sexguttatus*. It is the largest member of the group.

Length, 2.7 mm. Robust, oval. Black, rufo-piceous at tip of mandibles, on antennal scape and funicle, and tarsi; legs darker piceous; elytra dark red with base and suture, and sometimes denuded spot darker. Pubescence pale yellowish, very fine and scant above, except on scutellum and somewhat condensed in spots around the denuded fascia; more densely clothed beneath with fine squamiform hairs.

Beak moderately slender, curved, subopaque, coarsely striato-punctate; median carina distinct to apex; female beak longer than in male. Antennæ rufo-piceous or testaceous, with club dark; inserted at apical third in male and two-fifths in female; first joint elongate, as long as second and third; second joint equaling third and fourth combined; joints 3-7 globose, subequal, becoming slightly wider; club densely and finely pubescent, oval, almost equaling last six funicular joints. Eyes convex, free behind. Head convex, finely rugulose with a few remote piliferous punctures; front distinctly sulcate between the eyes, sulcus extending to base of beak. Prothorax wider than long; base one-half wider than apex; sides broadly rounded, plainly constricted before apex; transversely impressed in front, small round depression at sides of disk at basal third; coarsely, closely, and deeply punctured throughout; pubescence condensed along basal margin. Elytra one-third wider at base than prothorax, suboval, very convex on median line, a trifle wider posteriorly; sides almost straight to posterior third, slightly constricted behind humeri; striæ impressed, punctures moderately large, round, and closely approximate; interspaces slightly convex with an irregular row of minute setigerous punctures; scutellum

elongate oblong, densely pubescent. Legs not very slender; femora clavate, each armed with small acute tooth, and strongly constricted beyond the latter; tibiae in both sexes feebly sinuate internally. First two tarsal joints longer than wide.

The species differs from *sulcifrons* by its larger size, coloration, coarser thoracic punctuation, pygidium freely exposed in both sexes, tarsal joints longer than wide, and by the condensed spots of pubescence on the elytra. From *sexguttatus* it differs also by its large size and coloration, coarser thoracic punctuation, length of second funicular joint, and by the tooth on the posterior femora. It bears a superficial resemblance to *virgo* and *rufipennis*, but is separated by many characters.

Type.—Cat. No. 14475, U.S.N.M.

CHIONANTHOBIUS, new genus.

This genus belongs to the subfamily Tychiinae, tribe Plocetini, and is most nearly related to *Thysanocnemis*, from which it is separated by having the fourth ventral suture distinct and the beak carinate.

Beak slender, cylindrical, arcuate, separated from front by a deep concavity. Antennal scrobes directed at lower portion of eyes; scape attached beyond middle, elongate; funicle 7-jointed, joints elongate, the first longest, following joints diminishing in size; club elongate, jointed; eyes very narrowly separated above. Prothorax strongly narrowed in front. Scutellum ogival. Elytra wider than thorax; humeri rounded. Pygidium partly exposed, vertical. Front coxae contiguous, middle coxae narrowly separated; hind coxae widely separated. Thoracic side pieces large. First ventral suture indistinct, second and third laterally angulate, but not completely covering following segments. Femora with a faint indication of a tooth; tibiae unguiculate; third tarsal joint spongy beneath; tarsal claws cleft into two strong teeth, the inner almost as long as the outer.

Genotype.—*Chionanthobius schwarzi*, new species.

CHIONANTHOBIUS SCHWARZI, new species.

This beautiful species is described from a single individual selected from a long series collected by E. A. Schwarz on Plummer's Island, Maryland, July 6, 1906. According to Mr. Schwarz the weevils feed on the berries of the fringe tree (*Chionanthus virginica*) and the larvae develop in the seeds of the same tree.

Length, 5.5 mm.; breadth, 2.8 mm. Robust, oval. Color black; head, beak, legs, and antennae rufous; closely covered with scales which completely hide the body. Beak only scatteringly clad with fine white pubescence; head closely squamose with white and golden scales between the eyes, and with a band of golden scales behind the eyes bordered by a band of white scales; otherwise the head is very sparsely clothed with fine golden pubescence. Prothorax evenly and densely clothed with transversely placed, longitudinal,

recumbent scales, which meet on the median line in a low crest; a few white scales occur on the posterior margin; scutellum densely clad with white scales. The elytral vestiture consists of five irregular transverse color bands, of elongated scales, described as follows: Humeral band golden, broadest over humeri, interrupted by the white scutellum and first interspace, and on the second interspace by a dark brown spot. Post-humeral band white, beginning at base of last interspace, where it narrowly interrupts humeral band; it is slightly interrupted by humeral band on sixth to eighth interspaces, mixed with a few golden scales on remaining interspaces, diagonally interrupting sutural band on first to third interspaces; it is widest on first interspace, where it reaches scutellum. Median band broad, brownish black, projected forward on second interspace into post-humeral band, interrupted on lateral margin by the junction of the white post-humeral and post-median bands; slightly emarginate behind on fifth interspace, triangularly produced behind on eight middle interspaces. Post-median band white, irregular, projecting back on first, third, and fifth more than on adjoining interspaces, and from sixth to margin gradually widening. Apical band golden brown with black spots of varying length behind the white except on second interspace. Pygidium with golden pubescence. Vestiture of venter white, squamose, becoming pubescent behind and mixed with golden; legs with white pubescence.

Beak longitudinally rugose and medially carinate; prothorax with sides almost straight in basal third, then strongly convexly narrowed, strongly constricted before apex. Elytra convex, depressed, about one-half wider than prothorax; striæ evenly punctate, not impressed, stria punctures squamigerous; interspaces flat.

Type.—Cat. No. 14476, U.S.N.M.

TYLODES CLADOTRICHIS, new species.

Described from four specimens bred from roots of *Cladotrix lanuginosa* collected by E. A. Schwarz at San Diego, Texas, December 13, 1895 (U. S. Bureau of Entomology No. 6937).

Length, 6–7 mm.; breadth, 2.5–3 mm. Elongate oval, robust, black, covered with a thick spongy crust of scales of various sizes and shapes.

Beak moderately short, robust, slightly enlarged near base, when in repose hidden in ventral canal, broadly emarginate above at apex, and with a deep emargination at sides exposing attachment of mandibles; longitudinally punctato-sulcate, the punctures provided with broad, erect, ovoidal, brown scales; surface closely clothed with fine appressed, overlapping, dirty brown or gray scales, giving a very spongy appearance; base of beak more closely punctured and bristling with broad rounded erect black scales. Antennal scrobes deep, diagonal, directed at lower part of eyes, strongly constricted behind

attachment of scape, thence widening considerably and sharply outlined; scape attached at about apical fourth, not quite reaching eyes; funicle 7-jointed, the first elongate, about twice as long as second; second elongate, others becoming shorter and more transverse; club elliptical, jointed. Eyes separated above by width of beak, almost completely concealed by ocular lobes when beak is in repose. Head spongily squamose, deeply punctate, bristling with erect black scales. Prothorax with very uneven surface, widest at anterior third, then suddenly narrowed to apex which is one-half as wide as base; apex arcuately projecting over head, ocular lobes prominent, base shallowly concave: vestiture ruffled, with overlapping white, dirty gray or brown scales; erect larger scales of white and black in bristling patches, the black patches arranged in a square at base inclosing four small white patches; front and sides lighter with black scales scattered throughout. Scutellum concealed. Elytra oval, strongly narrowed behind with the suggestion of humeri in projections of the eighth interspaces over the basal angles of the thorax; striæ impressed with large deep punctures each bearing a large, round, concave, striate white scale; interspaces elevated, the odd intervals more so than the alternate intervals; the basal margin is also considerably elevated: vestiture of surface spongy, the odd interspaces bristling with erect scales, the even interspaces with a few; the erect scales brown, white, and black, arranged in transverse fasciæ across the elytra especially in the post-humeral and post-median regions; a white patch of large flat scales connecting the fifth punctures of the fourth and fifth interspaces is quite prominent, as are also black patches of erect scales at the base of the third interspace and on the same interspace between the white patches.

Rostral canal deep, forming an emargination and a pocket in the mesosternum. Mesocoxæ less widely separated than the other pairs. Abdominal intercoxal process large, broad, angulate apically. First ventral segment at center twice as long as second; third and fourth together hardly longer than second; fifth slightly larger, the last three segments deeply inclosed by the elytra. Vestiture beneath close-set, the scales overlapping, dull in color, with larger scales in the punctures; second ventral with two black apical spots, last three segments black pubescent with anterior rows of close-set brownish scales. Legs annulate with the appressed spongy pubescence and bristling with erect scales. Femora slender, mutic; tibiæ basally arcuate, apically strongly unguiculate and with a strong cluster of yellow bristles just below the unguis, apical margin clad with stout black cilæ; tarsal claws strong, divergent, simple.

This species bears a strong resemblance to *Thecesternus albidus* in form and in its peculiar vestiture. Old specimens will not display the brilliance of the black and white spots as described above.

Type.—Cat. No. 14477, U.S.N.M.

VARIATION IN THE SKULL AND HORNS OF THE ISABELLA GAZELLE.

By GERRIT S. MILLER, Jr.,

Curator, Division of Mammals, United States National Museum.

Mr. George L. Harrison, jr., has recently presented to the United States National Museum eight skulls of male *Gazella isabella* Gray taken during 1911 in a limited area near Jebel Bawati, Nubia. Five are fully adults of essentially uniform age, with basal suture obliterated, permanent dentition in place, and posterior molar moderately worn. The others, also uniform in age, are considerably younger, with basal suture open, milk dentition present though much worn, and third molar not fully in line with other teeth. The individual variations occurring in these specimens seem worthy of special note.

Skull.—In general proportions the skull does not vary conspicuously (see table of measurements, page 172). Premaxillary in contact with nasal in five specimens, not in contact in two (lost in the remaining skull). The shape of its upper extremity ranges from broadly, almost spatulately, truncate to narrowly tapering. Nasals varying considerably in length (34–48) and in relative breadth (ratio of breadth to length ranging from 40 to 50), posterior termination of bones usually pointed, but broadly rounded in 173824; deepest point of emargination of anterior border lying distinctly on outer side of middle in four specimens, at middle in three (one broken). Lachrymal pits not noticeably variable in development; vacuity at least twice as large in No. 173822 as in No. 173824. On ventral aspect of skull the chief regions of variation are the auditory bullæ and the posterior termination of palate. The portion of bulla exposed on ventral surface of skull ranges from 23 by 12 to 27.4 by 17; height above level of basioccipital 4.6 to 6.8, least width of basioccipital between bullæ 13.6 to 17. (In the skull with largest bullæ the condylobasal length is 4 mm. less than in that with the smallest.) Posterior border of palate usually with median and lateral emarginations extending forward to essentially the same level, but in one adult and one young the median cleft runs forward about 8 mm. beyond the lateral concavities; deepest point of lateral concavities in adults ranging from about level of posterior border of m^3 to middle of hinder lobe of same tooth.

Horns.—The horns of the adults vary conspicuously in robustness, in outline of cross section, in height to which the extremities rise above skull, and in plane occupied by the abruptly curved tip.¹ Most of these variations can be appreciated from the photographs in plate 15. Diameter of horn at base, 30.5 by 23.5 in No. 173819, 33 by 25.5 in No. 173822, these specimens representing the extremes. The cross section is usually flattened on the outer and posterior aspects, the region of juncture sufficiently abrupt to produce an evident angle or low rib extending from base of horn to beyond middle. In No. 173818 the flattening is very slight, while in No. 173820 it is practically absent, so that the section is broadly ovate in outline, wider posteriorly than anteriorly. The differences in the curves and general direction of the horns is sufficiently shown by the photographs of the six skulls which present the extremes of variation.² Though the abruptness of the curve at tip is subject to little variation, the plane in which the curved portion lies may be nearly horizontal, as in No. 173821, or nearly vertical, as in No. 173818. All intermediate positions occur, and in this respect there is often, as in No. 173825, an appreciable difference between the horns of the same pair.

Table of cranial measurements of Gazella isabella.

EXPLANATION OF PLATE 15.

Skulls of six specimens of *Gazella isabella* (about $\frac{1}{2}$).

No. 1, Cat. No. 173822.

No. 2, Cat. No. 173819.

No. 3, Cat. No. 173823.

No. 4, Cat. No. 173818.

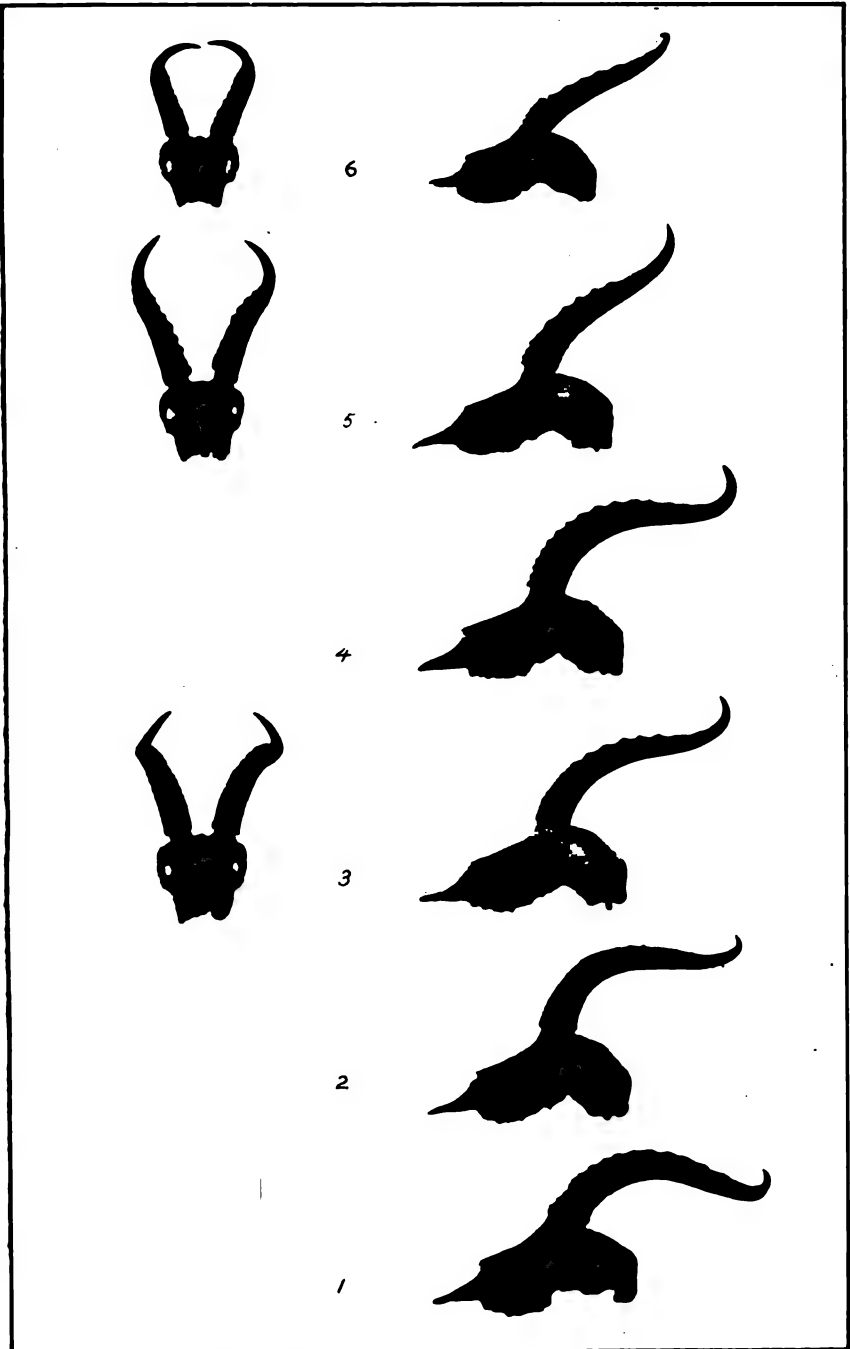
No. 5, Cat. No. 173825.

No. 6, Cat. No. 173821.

Note the progressive elevation of horns from No. 1 to No. 5. Plane of terminal hook nearly vertical in No. 4, nearly horizontal in No. 6.

¹ The abruptness of this curve, one of the main characters separating *Gazella isabella* from *G. dorcas*, is perhaps the least variable feature of the horns.

² All of the figured specimens are adult with the exception of Nos. 173821 and 173825.



SKULLS OF SIX MALES OF GAZELLA ISABELLA.

FOR EXPLANATION OF PLATE SEE PAGE 172.

DESCRIPTION OF A NEW ISOPOD CRUSTACEAN BELONG-
ING TO THE GENUS LIVONECA FROM THE ATLANTIC
COAST OF PANAMA.

By HARRIET RICHARDSON,

Collaborator, Division of Marine Invertebrates, United States National Museum.

Two specimens, representing a new species of *Livoneca*, were collected in January, 1911, by Dr. S. E. Meek, of the Field Museum of Natural History, and Mr. S. F. Hildebrand, of the United States Bureau of Fisheries, who were connected with an expedition sent out under the auspices of the Smithsonian Institution for a biological survey of the Panama Canal Zone. The description of the new species is herein given.

LIVONECA LONGISTYLIS, new species.

Body ovate, a little more than twice as long as wide, 13 mm.: 6 mm. Color light brown, marked with numerous black dots and arborescent markings.

Head a little wider than long, 2 mm.: $1\frac{1}{2}$ mm., subtriangular in shape with the front widely rounded. Eyes large, black, ovate, composite, situated in the post-lateral angles of the head and extending from the posterior margin to the middle of the head. The first pair of antennæ are composed of eight articles and extend the length of the last two articles beyond the posterior margin of the head. The second pair are composed of eight articles and are equal in length to the first.

The first, fifth, and sixth segments of the thorax are of equal length, being about $1\frac{1}{2}$ mm. in length; the second, third, fourth, and seventh segments are subequal, being each about 1 mm. long. The epimera do not quite reach the posterior margin except in the last segment. The thorax becomes gradually wider from the first segment to the fifth, and then becomes gradually narrower again.

The first five segments of the abdomen are short and subequal, each being almost one-half mm. in length, although the first is a little shorter and the fifth a little longer than the other three. The length of all five segments is $2\frac{1}{2}$ mm. The lateral parts of these segments are pro-

duced into triangular processes. The sixth or terminal segment of the abdomen is as long as wide, 3 mm.: 3 mm., becoming gradually narrower to an obtusely rounded extremity. The color and the markings extend only about half the length of the segment, the terminal half being white and semitranslucent. The peduncle of the uropoda extends half the length of the terminal segment; the branches are long and narrow, with tapering extremities; the outer branch is $2\frac{1}{4}$ mm. long and extends 1 mm. beyond the tip of the terminal segment; the inner branch is not quite so long as the outer branch and extends only one-half mm. beyond the tip of the abdomen.

The legs are all alike, prehensile, with long curved dactyli, the basis not furnished with any carina.

Two adult females were collected at Fox Bay, Colon, Panama, by Dr. S. E. Meek and Mr. S. F. Hildebrand. They were parasitic on *Anchovia browni*, being attached to the abdomen, midway between the base of the pectoral and ventral fins.

FIG. 1.—LIVONECA LONGISTYLIS, NEW SPECIES. X 44.
(DRAWN BY MISS V. DAN-
DRIDGE.)

This species differs from the other known species of this genus found on the Atlantic coast of North America by its larger eyes, its much longer terminal abdominal segment and much longer and differently shaped uropoda.

The types are in the United States National Museum. (Cat. No. 43350.)

A NEW NEMATODE, *OSTERTAGIA BULLOSA*, PARASITIC IN THE ALIMENTARY TRACT OF SHEEP.

By BRAYTON HOWARD RANSOM,

Assistant Custodian, Helminthological Collections, United States National Museum,

AND

MAURICE C. HALL,

Assistant Zoologist, Bureau of Animal Industry, United States Department of Agriculture.

The nematode described in this paper was first collected by the junior author at an abattoir in Colorado Springs, Colorado, April 28, 1911. Comparison with the descriptions of species given in Ransom (1911) led to the conclusion that the species was probably new. Specimens were then sent to the senior author who also was of the opinion that it was a new species. The sheep from which this material was collected were originally from the ranch of Mr. W. H. Wells near Resolis, Colorado, and specimens of the nematode here described were collected by both of us during the summer of 1911 from sheep at Mr. Wells's ranch. The nematode was found in nearly every sheep examined at the ranch and was the only nematode found in the stomach with the exception of the stomach worm, *Hæmonchus contortus*. The new species was also found by us in sheep at the ranch of Mr. W. T. Kennedy near Amo, Colorado. A single specimen was found once in the intestine, but the occurrence of this nematode in the intestine was probably accidental, as the fourth stomach is evidently the normal location. In Colorado the greatest number of *Ostertagia* found in a single sheep was 73 and the greatest number of *Hæmonchus contortus*, 537. Usually there were less than a dozen of each. This comparative freedom from infection with nematodes in Colorado sheep is to be attributed in part to the dry climate and in part to the extensive area covered in range feeding, thereby preventing concentration of infection.

Mr. W. D. Foster of the Zoological Division, Bureau of Animal Industry, has called our attention to a single specimen of a nematode, a female, collected by him May 13, 1910, from a sheep received in

Washington from Montana. This specimen he had been unable to identify with any described species. Examination shows that it is of the same species as that collected by us in Colorado. *Ostertagia bullosa* is therefore known to occur in two of the Rocky Mountain States. Two other species of this genus have been found thus far only in the Rocky Mountain region, namely *Ostertagia marshalli* and *O. occidentalis*, these two being reported heretofore only from Montana. To these records may be added our finding, in 1911, at a Denver abattoir, of *O. marshalli* in sheep from Wyoming and Utah, and of *O. occidentalis* in sheep from Wyoming.

The new species is white when freshly collected and has the usual characteristics of the genus *Ostertagia*, but differs from other species of the genus in that the two ventral rays of each lateral lobe of the bursa are rather widely divergent, the spicules are simple and not split into several processes posteriorly, and the gubernaculum is of the same yellow-brown color as the spicules instead of being colorless.

In the key given in Ransom (1911) this species runs down to *Ostertagia trifurcata* of which only the male is known. In several respects, however, it differs from *trifurcata*. The gubernaculum in *O. trifurcata* is a narrow colorless structure, whereas in *O. bullosa* it is a yellowish-brown structure, irregularly trihedral in shape. The spicules in *O. trifurcata* are twisted but are not curved in their long axis, and are divided into 3 processes at the posterior end. The spicules in *O. bullosa* are narrow, curving, tubular structures, not divided at the posterior end which is acutely pointed. Each of the two terminal branches of the dorsal ray in *O. trifurcata* has a short process on the outer side and one on the inner. *O. bullosa* has a short process on the outer side, but the process on the inner side is only suggested by a slight and often indistinct bifurcation at the tip.

The principal characters of *O. bullosa* are as follows:

OSTERTAGIA BULLOSA Ransom and Hall, 1912.

Specific diagnosis.—*Ostertagia*: *Male* (fig. 1) about 7.3 mm. long. Maximum thickness 115 μ just in front of bursa. Diameter of head 17 μ ; diameter of body at level of nerve ring 44 to 48 μ , at base of esophagus 68 μ . Esophagus 510 to 545 μ in length, surrounded by a nerve ring at a distance of 220 to 250 μ from the anterior end. The excretory pore is situated about 270 μ from the anterior end of the body. Cervical papillæ not evident. The esophagus increases in diameter from 16 μ anteriorly to 45 or 50 μ at its posterior end. The bursal membrane has a very distinct longitudinal striation. The median lobe is only slightly shorter than the lateral lobes. The lateral lobes are usually partly folded over each other in their ventral portions. The ventro-ventral (fig. 2, *v. v.*) and latero-ventral (fig. 2, *l. v.*)

rays diverge considerably, which is unusual in the genus *Ostertagia*, and their tips are at least half as far apart as the tips of the latero-ventral and externo-lateral rays. The distance between the tips of the externo-lateral and medio-lateral rays is much less than that between the latter and the tip of the postero-lateral ray. Of the paired rays, the latero-ventral is the thickest. Following this in the order of size are

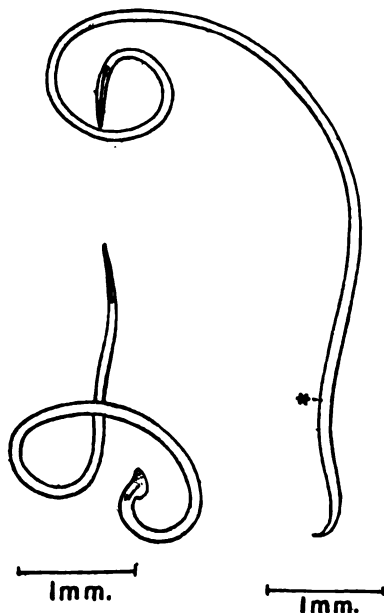


FIG. 1.—*OSTERTAGIA BULLOSA*. MALE AND FEMALE. *VULVA. ENLARGED.

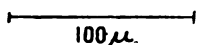


FIG. 2.—*OSTERTAGIA BULLOSA*. POSTERIOR END OF BODY OF MALE, VIEWED FROM LEFT SIDE. *bul.*, PREBURSAL BULLA; *d.*, DORSAL RAY; *e. d.*, EXTERNO-DORSAL RAY; *e. l.*, EXTERNO-LATERAL RAY; *gub.*, GUBERNACULUM; *l. v.*, LATERO-VENTRAL RAY; *m. l.*, MEDIO-LATERAL RAY; *p. l.*, POSTERO-LATERAL RAY; *sp.*, LEFT SPICULE; *v. v.*, VENTRO-VENTRAL RAY. ENLARGED.

the externo-lateral (fig. 2, *e. l.*), then the medio-lateral (fig. 2, *m. l.*), the postero-lateral (fig. 2, *p. l.*), and the externo-dorsal (fig. 2, *e. d.*), which are of about the same size, and lastly the ventro-ventral. The dorsal ray (fig. 2, *d.*) is about $140\ \mu$ long and is bifurcated 25 to 40 μ from its posterior end. The terminal branches have each a small branch, sometimes reduced to a mere knob, on the outer side. At times each of the terminal branches ends in a very small fork and at times appears to end without forking. The spicules (fig. 2, *sp.*) are 140 to 180 μ long and 15 to 20 μ wide at the anterior end. They gradually narrow toward the posterior end, which is pointed, and do not fork. Usually the tips are curved but in some

specimens they appear to be straight. The gubernaculum (fig. 2, *gub.*) is irregularly trihedral in shape, somewhat resembling a plow-



FIG. 3.—*OSTERTAGIA BULLOSA*. TAIL OF FEMALE, VIEWED FROM LEFT SIDE. ENLARGED.

share in outline when viewed from the side, and prolonged into a short slender process anteriorly. Measured from the side it is about $25\ \mu$ wide and $65\ \mu$ long. It is of the same yellow-brown color as the spicules.

A well-marked character of this species is a prominent cuticular swelling anterior of the bursa on the ventral surface (fig. 2, *bul.*). For some distance anterior of the swelling the cuticle on the ventral surface is somewhat thickened and at a distance of 100 to $125\ \mu$ in front of the bursa the cuticle splits to form this swelling. When



FIG. 4.—*OSTERTAGIA BULLOSA*. REGION OF VULVA OF FEMALE, VIEWED FROM LEFT SIDE. *e.*, EGG; *lab.*, RUDIMENTARY CUTICULAR FLAP ANTERIOR OF VULVA; *ovfj. 1.*, TERMINAL PORTION OF OVULECTOR; *ovfj. 2.*, SPHINCTER OF OVULECTOR; *ovfj. 3.*, NONMUSCULAR PORTION OF OVULECTOR; *ut.*, UTERUS; *vtl.*, VULVA. ENLARGED.

viewed from the side, the optical section of the cuticle forming the ventral boundary of the swelling is usually oval but sometimes has a more rectangular outline, resembling somewhat the trigger guard on a rifle. The swelling is apparently filled with a clear transparent fluid. The prebursal papillæ are located near the lateral limits of this swelling and about $15\ \mu$ in front of the anterior edge of the bursa.

Female (fig. 1), 8.8 to 9.8 mm. long by about $13\ \mu$ wide in the region of the vulva. The head measures 20 to $25\ \mu$ in diameter. At the nerve ring the body is 50 to $60\ \mu$ in thickness, at the base of the esophagus 70 to $80\ \mu$, and at the anus 50 to $55\ \mu$. The esophagus is 580 to $620\ \mu$ long and is surrounded by a nerve ring 220 to $255\ \mu$ from the anterior end. The excretory pore is 265 to $320\ \mu$ from the anterior end. Cervical papillæ not evident. The vulva (fig. 4, *vul.*) is transversely elongated, commonly presenting a crescentic outline with the convexity of the crescent directed posteriorly. At times a very small, rudimentary cuticular flap (fig. 4, *lab.*) is evident. The vulva is situated 1 to 1.3 mm. from the posterior end of the body. The tail (fig. 3) tapers posteriorly, always curving ventrally and usually curving more sharply near the end to form a rather open hook, which terminates in a slightly enlarged, rounded tip. The cuticle of the tail beginning in the anal region and extending to the tip is marked by very fine transverse striations close together. The anus is situated 120 to $150\ \mu$ from the tip of the tail. The cuticle surrounding the anus is usually swollen so that a prominence appears at this point 25 to $35\ \mu$ in diameter and 5 to $8\ \mu$ high. The combined length of the muscular portions of the ovjectors (fig. 4, *ovij.*), including the sphincters, is 220 to $360\ \mu$. The maximum size of the eggs (from measurements of eggs observed in the ovjectors) is $85\ \mu$ long by $65\ \mu$ wide (fig. 4, *e.*).

Host.—*Ovis aries*.

Location.—Fourth stomach.

Localities collected.—Colorado; Montana.

Type-specimens.—Cat. No. 16083, U.S.N.M. (Bureau of Animal Industry Helminthological collection); collected July 30, 1911, at Wells's ranch, Resolis, Colo., by B. H. Ransom from the fourth stomach of a sheep.

REFERENCE.

- RANSOM, B. H. 1911. The nematodes parasitic in the alimentary tract of cattle, sheep, and other ruminants. Bull. 127, Bureau Animal Ind., U. S. Dep. Agr., Washington, 132 pp., figs. 1-152.

INSTRUCTIONS FOR COLLECTING AND FIXING ROTIFERS IN BULK.¹

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A glance at the published zoological results of scientific expeditions is sufficient to show that rotifers are conspicuous by their rarity, if not by their total absence. This is accounted for by the small interest generally accorded these animals, as well as by the fact that investigators, even when devoting their attention exclusively to the fresh-water fauna, rarely procure material in such condition as to be of any use for systematic work. Rotifers are very delicate and contractile, and in collections preserved in bulk in alcohol or formalin they become as a rule unrecognizable, with the exception of those species which have the body incased in a chitinous shell or lorica; in some cases this is sufficient for specific determination. In the case of the genera *Anuræa* and *Brachionus* this has become a positive misfortune, as it has resulted in an absolutely unjustifiable multiplication of species based on the excessively variable spiny prolongations of the lorica.

It may be objected that this void is of small importance, as it is generally conceded that rotifers are distributed with almost absolute uniformity all over the world.² But it is equally well known that there is a host of rare and local forms, often of the greatest interest to the morphologist, which can be discovered only by careful exploration. As an example, it is sufficient to mention the famous genus *Trochosphaera*, which although widely distributed appears to be confined to subtropical latitudes. Furthermore underlying this apparent uniformity there is a multitude of problems relating to the means whereby it is established and maintained, and they can be solved only by an exact knowledge of the faunal development under varying conditions and in different environments. As specially important

¹ Translated and adapted from *Archives de zoologie expérimentale et générale*, ser. 4, vol. 4, 1906, *Notes et revue*, pp. xxvii-xxxiii, by H. K. Harring, Bureau of Standards.

² See on this subject: C. T. Hudson, *Journ. Roy. Micr. Soc.*, 1891, p. 6; V. G. Thorpe, *Journ. Roy. Micr. Soc.*, 1896, p. 485; H. S. Jennings, *Bull. U. S. Fish Comm.*, vol. 19 (1899), 1900, p. 67.

subjects for investigation may be mentioned lakes situated at great altitudes, isolated oceanic islands, unexplored and not yet colonized regions (man is probably one of the most active factors in this dispersion), and brackish waters of varying degrees of salinity.

The value of limnologic and hydrobiologic research in its relation to fish culture and hygiene is now universally admitted, quite apart from its theoretical interest, and every student of fresh-water biology knows that rotifers are frequently the predominant group, and always an important one, furnishing one of the most valuable characteristics. As an example may be cited Lauterborn's recent work on the fauna of the Rhine,¹ according to which a list of the rotifers from a certain body of water enables the specialist to decide whether it is pure and running, stagnant and full of vegetation, or polluted and putrid. But the determination of rotifers can not usually be made with certainty except from living or carefully prepared specimens, conditions demanding not only time and equipment usually not available on expeditions or limnologic campaigns, but an experience which few have the time to acquire.

As the methods suitable for Crustacea and Planarians are useless here, I have, in order to overcome these difficulties, tried to discover, and I believe have found, a method which, without being as simple as placing the whole catch in alcohol, will allow any careful worker and especially a resident naturalist to prepare rotifers in bulk in such condition that they may be useful for subsequent study. The method now used exclusively for the preparation of rotifers as objects for the microscope is due to Rousselet;² it consists in narcotizing the animals with a cocaine solution, followed by fixation with osmic acid and mounting in weak formalin solution. I have succeeded in reducing its application to animals in large quantities to an almost automatic process.

The necessary reagents are:

1. A concentrated narcotizing solution (about three times as strong as Rousselet's original formula):

Cocaine hydrochlorate.....	gram..	1
Pure methyl alcohol.....	cubic centimeter..	10
Distilled water.....	do.....do.....	10

Instead of cocaine one may use the same amount of stovaine, or β -eucaine hydrochlorate.

2. A solution of osmic acid of 1 per cent strength, to which is added 1 per cent chloro-platinic acid, commonly known as platonic chlorid, sold either in the form of crystals or as a 10 per cent solution. The latter is added to prevent reduction of the osmic acid, which in this way will keep almost indefinitely.

¹ Arb. aus dem kais. Gesundheitsamte, Berlin, vol. 22, 1905, pp. 630-652.

² Journ. Quekett Micr. Club, ser. 2, vol. 6, 1896, pp. 5-13; also Proc. 4th Int. Congr. Zool., Cambridge 1896 (published 1899), p. 197.

Their use is, even though apparently complicated, in reality quite simple. It is necessary to distinguish, both in collecting and subsequent fixation, two classes of rotifers—the purely pelagic forms, which swim without ever anchoring themselves and belong to the true plankton, and the forms which are not good swimmers, but move about among detritus and aquatic vegetation in search of sustenance, not traveling far, and frequently fixing themselves by the toes. We will treat them separately.

The plankton of smaller bodies of water, ponds, pools, ditches, etc. ("Heleoplankton" of Zacharias), is periodic, appearing and disappearing in a few days or a couple of weeks. The rotifers in such places generally have two periods of especial abundance, one in the spring, the other in the autumn. April-May and September-October are for the neighborhood of Washington the best times to collect these animals. This is also the time for the appearance of the males. For their capture a small net of what is known as "china silk" is very suitable. The lower end of the net should be tied around the neck of a wide-mouthed bottle. In this way the surplus water is filtered off; and the animals remain in the bottle in a small quantity of water, which is poured into a suitable bottle for transportation. If procurable, an aluminum tube, closed at the bottom, is preferable to the wide-mouthed bottle for use with the net, as it does not break on accidental contact with stones or other hard objects. No stagnant pool should be neglected, no matter how small or apparently impure. A number of species accommodate themselves to these conditions. Water with abundant organic matter, as, for instance, farm-yard ponds, is the favorite resort of certain species like *Hydatina senta*, in fact, wherever microscopic algæ are abundant. The plankton of swamps, lakes, and rivers may be collected by the usual methods, although the apparatus can be much simpler. This applies also to marine rotifers occasionally found in great abundance in littoral plankton.

The fixation of the collected material may without detriment be deferred a few hours, according to convenience. By the aid of a strong magnifier it is ascertained whether the rotifers are present in sufficient numbers to warrant the treatment. It is well to concentrate the animals in the smallest possible quantity of water, as the reagents are rather expensive. This is accomplished quite easily by exposing the collection in a glass jar to a one-sided illumination for half an hour. The rotifers soon assemble in a small, whitish cloud, easily visible to the naked eye, on the illuminated side, near the surface, and with a pipette they are transferred to a tube of 2 to 10 cubic centimeters capacity for fixation.¹

The narcotizing operation consists in adding to this tube solution No. 1 in small portions, mixing well each time. The animals at first

¹ If apothecaries' measure is used, it may be noted that 1 cc. equals $\frac{1}{8}$ fluid dram.

suspended in the water gradually sink and finally fall to the bottom, leaving the liquid clear; a sign that their cilia have ceased to move. At this moment they should be fixed, in order to retain their form; if killed before completely narcotized, they will contract. The doses and time intervals are: Every five minutes add from 1 to 3 drops of the cocaine solution for each cubic centimeter of water in the tube. After repeating this three times the narcotizing is usually finished. To acquire practice, it is advisable to go through the operation two or three times with a microscope at hand. Other animals, mainly Entomostraca, that may be present do not suffer at all from the narcotization, as they are also affected by the cocaine and sink to the bottom about the same time.

For fixation add to the tube 1 drop of the osmic acid mixture for each cubic centimeter of its contents and mix rapidly. This amount should not be exceeded or the animals will be strongly blackened. When they have settled to the bottom of the tube, in 5 or 10 minutes at the most, the liquid is carefully decanted and the tube refilled with water. This is repeated two or three times in a few hours at intervals according to convenience, finally filling the tube with formalin solution, 1 part commercial formalin (40 per cent formaldehyde) to 9 parts distilled water. For transportation it is well to use quite a small tube. A slip of paper with necessary data should be inclosed in each.

To obtain the nonpelagic forms, aquatic plants (not temporarily submerged plants), especially such as have finely divided leaves, *Batrachium*, *Myriophyllum*, *Ceratophyllum*, and also floating plants, as *Lemna*, *Riccia*, etc., should be brought home in a jar or tin can. They should then be put into a glass jar with sufficient water to cover them and left standing for two or three hours. All the animals gradually come to the surface and collect on the illuminated side. Direct sunlight should be avoided, as it liberates oxygen from the plants and it is the lack of this that drives them to the surface.

Quite an extensive fauna is to be found in mosses, *Sphagnum*, etc., and as the only treatment necessary for this is simply to pick a few handfuls of it and allow it to dry naturally, it is one of the easiest to obtain. It should be collected from both wet and dry places. The *Bdelloida* are equally at home in both, and if Hepatics, such as *Jungermannia*, *Frullania*, and others can be obtained, so much the better. The surface layer of mud in dried-up pools should be scraped off, well dried, but not heated, and finally stored in paper bags, if possible sterilized, which, when once closed, should not again be opened until arrival at the point of destination in order to avoid contamination. The samples should be guarded against too high temperature, laboratory fumes, etc., which are usually the reasons why the animals fail to revive.

This method is useful not only for rotifers, but most of the accompanying forms, Oligochætes, Planarians, Entomostraca, and even the smaller Nematodes, are obtained in good condition, as well as the majority of Infusoria, unicellular Algæ, and Flagellates. If Protozoa are the main object, the narcotization may be dispensed with, as it is injurious to certain delicate species. Finally, it may be added that the method of Rousselet, that is, narcotization, followed by fixation with dilute osmic acid, and final mounting in weak formalin, is the only known method for the preservation of all the small transparent, vacuolate animals—in other words, the great majority of pelagic forms, marine as well as fresh water. It yields results not attainable by any other method. The usual dehydrating and clearing agents ruin nearly all these delicate animals.

* * * * *

The United States National Museum will be glad to receive material preserved in this manner and will arrange for its determination.

MARINE AND TERRESTRIAL ISOPODS FROM JAMAICA.

By HARRIET, RICHARDSON,

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MARINE ISOPODS.

While working in the Johns Hopkins laboratory at Montego Bay, Jamaica, in 1910, Dr. C. B. Wilson and Dr. E. A. Andrews collected a large number of isopods for the United States National Museum. A list of the species is herein given with notes on the variation of *Exocorallana tricornis* (Hansen) and *Exocorallana quadricornis* (Hansen). The notes on the color markings were furnished by Doctor Wilson. A new species of *Exosphaeroma* was collected by Doctor Andrews, the description of which is given below.

Family TANAIIDÆ.

LEPTOCHELIA DUBIA (Krøyer).

Tanais dubius KRØYER, Nat. Tidsskr., vol. 4, 1842, p. 178, pl. 2, figs. 20-22.

Leptochelia dubia RICHARDSON, Trans. Conn. Acad. Sci., vol. 11, 1902, p. 279.

Leptochelia incerta MOORE, Bull. U. S. Fish Comm., vol. 20, pt. 2, 1900, pp. 165-166.

Locality.—Bathing Beach, Montego Bay. (Collected by E. A. Andrews.) Five specimens.

Family GNATHIIDÆ.

GNATHIA, species ?

Locality.—Montego Bay. A number of larvæ from gills of Jack (*Caranx crysos*) and from the mouth of a Yellow Jack. (Collected by C. B. Wilson.)

Family CIROLANIDÆ.

CIROLANA PARVA Hansen.

Cirolana parva HANSEN, Vidensk. Selsk. Skr. (6), vol. 5, 1890, pp. 340-341, pl. 2, figs. 6-6b; pl. 3, figs. 1-1d.—MOORE, Bull. U. S. Fish Comm., vol. 20, pt. 2, 1900, p. 167, pl. 8, figs. 6-8.—RICHARDSON, Bull. U. S. Nat. Mus., No. 54, 1905, pp. 111-114.

Locality.—Bogue Islands, Montego Bay. About 25 specimens. Found living upon mangrove roots. (Collected by E. A. Andrews.)

Family EXOCORALLANIDÆ.

EXOCORALLANA QUADRICORNIS (Hansen).

Corallana quadricornis HANSEN, Vidensk. Selsk. Skr. (6), vol. 5, 1890, p. 382, pl. 7, fig. 3.

Locality.—Bogue Islands, Montego Bay. Two specimens. Commensal in black ascidian on mangrove roots. The color is gray-white with a pattern of light-brown stripes and spots. (Collected by C. B. Wilson.)

Also about 25 specimens, found living in burrows in a bright red sponge on mangrove roots. These have the horns on the head very large. The color is white with a light-brown pattern over the dorsal surface, just as in the preserved specimens (collected by C. B. Wilson); three specimens were taken from a red sponge on mangrove roots. (Collected by E. A. Andrews.)

EXOCORALLANA TRICORNIS (Hansen).

Corallana tricornis HANSEN, Vidensk. Selsk. Skr. (6), vol. 5, 1890, pp. 379-381, pl. 6, figs. 4-4p; pl. 7, figs. 1-1d.—MOORE, Bull. U. S. Fish Comm., vol. 20, pt. 2, 1900, p. 169, pl. 9, figs. 2-5.

Localities.—Montego Bay and White Rock.

Of the specimens from Montego Bay, there was 1 specimen, parasitic on hog-fish, *Lachnolaimus maximus*; about 10 specimens, parasitic on yellow-tail (*Ocyurus chrysurus*); about 10 specimens, parasitic on green parrot-fish (*Sparisoma viride*)—these have the horns on the head small; 8 specimens, parasitic on red snapper (*Neomænis aya*). The color is snow-white, the dorsal surface with spots and lines of dark blue-black; eyes brown; egg masses brown at first, later changing to dark blue-black. About 23 specimens, parasitic on yellow-jack (*Caranx crysos*); about 75 specimens, parasitic in mouth of yellow-jack (*Caranx crysos*); about 50 specimens, parasitic in eye sockets and mouth of rock-fish (*Mycteroperca bowersi*). The color is white with an open pattern of light brown over the dorsal surface, thinning to separate spots along the lateral margins; the egg mass is at first pale yellow-brown, deepening with development until it becomes almost jet-black; the eyes are dark brown. One specimen, parasitic in the gill cavity of the red snapper (*Neomænis aya*); about 30 specimens, parasitic in mouth of a 20-pound red snapper (*Neomænis aya*). The horns on the head are very small. The color is whitish, the cartilage gray, with the dorsal pattern in light cinnamon-brown; the eggs are light brown; the eyes are dark brownish-black. Three specimens, parasitic on the green parrot-fish (*Sparisoma viride*); 4 specimens, parasitic on French grunt (*Hæmulon flavolineatum*); 1 specimen, parasitic on gills of jack (*Caranx hippos*); 1 specimen, parasitic on barracuda (*Sphyræna barracuda*); 8 specimens, from eye sockets and mouth of the large blue parrot-fish (*Scarus cæruleus*). The color of large females with eggs is white, with a row of star-shaped brown spots across the center of each thoracic segment on the dorsal surface, the abdomen with a wash of faint brown over the entire


dorsal surface; the egg mass is a bright green-blue; the eyes are brown. In the younger, or smaller individuals the star-shaped marks are confluent over the whole surface of the thorax and abdomen. The horns between eyes are very small. The frontal horn is large and broad, rounded. The eyes are large and close together. Twelve specimens, parasitic on lane snapper (*Neomænis synagris*). The color is white, the dorsal surface with one or two rows of brown star-shaped spots across each segment; the eyes are dark blue-black. The frontal horn is very large, rounded, produced, upturned. The eyes of both sexes are large and close together. Eight specimens, parasitic in eye sockets of the yellow-tail (*Ocyurus chrysurus*). The color is light brownish-yellow, with a row of brown star-shaped spots across each segment on the dorsal surface; the eyes are dark seal-brown; the egg masses are a bright salmon-pink. All the horns on the head are small, the two posterior ones almost obsolete. The eyes in both sexes are very large and close together. Four specimens, parasitic in the eyes of the yellow-tail (*Ocyurus chrysurus*). The color is a light yellowish-white, each segment with a single row of brown spots across the dorsal surface. The eyes are very large and close together, almost confluent in one specimen. One specimen, from the fins of the sea-percupine (*Diodon hystrix*). The color is gray-white, with a row of brown star-shaped spots across the dorsal surface of each segment; the eyes are dark brown. This is probably an immature female. (Collected by C. B. Wilson.)

One specimen from White Rock, from the gill cavity of the rock-hind (*Epinephelus adscensionis*). The color of the ventral surface is white, of the dorsal surface white, nearly covered with a loose pattern of light reddish-brown; the eyes are black; the claws on the tips of the legs red-brown; the legs themselves white.

Family ÆGIDÆ.

ROCINELA SIGNATA Schiodte and Meinert.

Rocinela signata SCHIODTE and MEINERT, Nat. Tidsskr. (3), vol. 12, 1879-80, pp. 399-401, pl. 13, figs. 3-6.—MOORE, Bull. U. S. Fish Comm., vol. 20, pt. 2, 1900, p. 171, pl. 10, fig. 2.—RICHARDSON, Bull. U. S. Nat. Mus., No. 54, 1905, pp. 209-210.

Locality.—Montego Bay; parasitic on the French grunt (*Hæmulon flavolineatum*). The color is beautifully variegated in delicate shades of brown, pink, and gray. The head and first three segments and the abdomen are delicate pink with fine dots and lines of red-brown on the dorsal surface; the remaining thoracic segments are a light olive-gray, with variegated spots, lines, and blotches of dark olive-green, the fourth segment with a prominent wide transverse band of dark brown spots; all the segments have a narrow band of red-brown on the lateral margins; the telson has a central crescent of black spots shaped like this ; the eyes light pink; the egg mass is jet-black.

A second specimen was found parasitic on the parrot-fish (*Sparisoma abildgaardii*); it had small spots of brownish purple on the dorsal surface.

A fragment was found parasitic on the hog-fish (*Lachnolaimus maximus*). (Collected by C. B. Wilson.)

Family CYMOTHOIDÆ.

ANILOCRA LATICAUDA Milne Edwards.

Anilocra laticauda MILNE EDWARDS, Hist. Nat. Crust., vol. 3, 1840, p. 259.

Anilocra mexicana SAUSSURE, Rev. Mag. Zool., 1857, p. 505.

Anilocra leachii (KRØYER) SCHIEDTE, Nat. Tidsskr. (3), vol. 4, 1866, p. 205, pl. 11, figs. 2a-2g.

Anilocra laticauda SCHIEDTE and MEINERT, Nat. Tidsskr. (3), vol. 13, 1881-83, pp. 126-131, pl. 11, figs. 1-3.—MOORE, Bull. U. S. Fish Comm., vol. 20, pt. 2, 1900, p. 172, pl. 10, figs. 3-4.—RICHARDSON, Bull. U. S. Nat. Mus., No. 54, 1905, pp. 227-228.

Locality.—Montego Bay; one female; parasitic on the parrot-fish. The color is dark slaty-blue, uniform throughout. (Collected by C. B. Wilson.) One female; parasitic on the eye of the yellow-tail (collected by C. B. Wilson). The color is uniform gray-white, the brown mark due to partial drying in the sun. One male; found attached to outside of cheek at the angle of the jaw of *Bathystoma rimator* (collected by C. B. Wilson). The color is light brown above, deeper toward the lateral margins and on the posterior pair of appendages (telson); the eyes are white with a small black dot in the center of each facet. The respiratory lamellæ have a fine penciling of brown lines, thicker and darker in color near the outer margins. One male; parasitic on *Bathystoma rimator* (collected by C. B. Wilson). One female (collected by E. A. Andrews). One female; from a small yellow-tail (collected by E. A. Andrews).

CYMOTHOA ŒSTRUM (Linnaeus).

Oniscus œstrum LINNÆUS, Syst. Nat., ed. 10, vol. 1, 1758, p. 636, No. 2; Fauna Suecica, ed. 2, 1761, p. 499, No. 2053; Syst. Nat., ed. 12, vol. 1, 1767, pt. 2, p. 1059, No. 2.

Asellus œstrum OLIVIER, Encycl. Method., vol. 4, 1789, p. 253.

Cymothoa œstrum FABRICIUS, Entom. Syst., vol. 2, 1798, p. 505, No. 6.—LEACH, Trans. Linn. Soc. London, vol. 11, 1815, p. 372; Dict. Sci. Nat., vol. 12, 1818, p. 352.

Cymothoa dyfresnei LEACH, Dict. Sci. Nat., vol. 12, 1818, p. 352.

Cymothoa immersa SAY, Journ. Acad. Nat. Sci. Phila., vol. 1, 1818, pp. 399-400.

Cymothoa œstrum DESMAREST, Cons. Gén. Crust., 1825, p. 309, pl. 48, figs. 6-7.—MIERS, Proc. Zool. Soc. London, 1877, pp. 671-672.—SCHIEDTE and MEINERT, Nat. Tidsskr. (3), vol. 14, 1883-84, pp. 271-279, pl. 8, figs. 5-13.—RICHARDSON, Bull. U. S. Nat. Mus., No. 54, 1905, pp. 254-256.

Locality.—Montego Bay; one male; parasitic on parrot-fish (*Sparisoma abildgaardii*). The color is a uniform yellowish-gray. (Collected by C. B. Wilson.)

Family SPHÆROMIDÆ.

EXOSPHEROMA CRENULATUM (Richardson).

Sphæroma crenulatum RICHARDSON, Trans. Conn. Acad. Sci., vol. 11, 1902, pp. 292-293, pl. 39, fig. 40; Bull. U. S. Nat. Mus., No. 54, 1905, p. 298.

Locality.—Montego Bay; 2 specimens; living on the outside of a chiton. (Collected by C. B. Wilson.)

EXOSPHEROMA ANTILLENSE, new species.

Body contractile, able to roll into a complete ball; surface reticulate; color yellow, with a few scattered spots of brown; on the head are three arcuate patches of brown; on the first segment there is a transverse band of brown about the middle of the segment; on the second segment are two small transversely elongated patches of brown on either side of the median line situated close together; on the fourth segment are four patches, two on either side of the median line, the two middle ones being far apart; on the fifth, sixth, and seventh segments are two patches on each segment, one on either side of the median line; on the first abdominal segment are two patches in longitudinal series on either side of the median line and three patches in longitudinal series on the lateral parts of the segment; on the terminal abdominal segment are two patches, one on either side of the median line, situated close together.

The head is wider than long and has the front produced in a small median point. The eyes are small, composite, more or less ovate with the upper end produced angularly, and situated in the post-lateral angles of the head. The first pair of antennæ have the first article large, and elongate, about twice as long as wide; the second article is small and rounded, and is about one-third the length of the first article; the third article is narrow, elongate, and is about one-and-a-half times the length of the second article; the flagellum, composed of eleven articles, extends about two-thirds the length of the lateral margin of the first thoracic segment. The second antennæ, with a flagellum composed of twelve articles, extend to the posterior margin of the third thoracic segment.

The first segment of the thorax is a little longer than any of those following and has the post-lateral angles produced backward and the antero-lateral angles produced forward on either side of the head. The following six segments are subequal.

FIG. 1.—*EXOSPHEROMA ANTILLENSE*.
X 84.

The abdomen is composed of two segments, the first with three suture lines on either side indicative of other partly coalesced segments. The second or terminal segment is produced to an extremity which is somewhat truncate, with a slight emargination in the middle. On the dorsal surface are two large, elevated tubercles, one on either side of the median line. The uropoda do not extend beyond the apex of the terminal segment of the abdomen; both branches are similar in shape, posteriorly rounded, but the outer one is shorter, extending only two-thirds the length of the inner branch.

The legs are all alike, ambulatory.

Only one specimen was collected by E. A. Andrews at Montego Bay. It was dredged off the bathing beach.

Type.—Cat. No. 43349, U.S.N.M.

As the specimen was completely rolled up into a ball, it was impossible to get at the pleopods without injuring it.

DYNAMENE MOOREI Richardson.

Dynamene perforata MOORE (female), Bull. U. S. Fish Comm., vol. 20, pt. 2, 1900, pp. 173-174, pl. 10, fig. 10.—RICHARDSON (female), Trans. Conn. Acad. Sci., vol. 11, 1902, pp. 291-292.

Dynamene moorei RICHARDSON, Bull. U. S. Nat. Mus., No. 54, 1905, p. 303.

Locality.—Snug Harbor, Montego Bay; about 17 specimens; found under girdle of chitons taken at tide line. (Collected by E. A. Andrews.)

TERRESTRIAL ISOPODS.

The following isopods were collected in Jamaica by Dr. Thomas Barbour.

Family ONISCIDÆ.

PORCELLIO LÆVIS Latreille.

Porcellio lævis LATREILLE, Hist. Nat. Crust. et Insectes, vol 7, 1804, p. 46; Genera Crustaceorum et Insectorum, vol. 1, 1806, p. 71.—LEACH, Edinb. Encycl., vol. 7, 1813-14, p. 406; Trans. Linn. Soc. London, vol. 11, 1815, p. 375.—MILNE EDWARDS, Hist. Nat. Crust., vol 3, 1840, p. 169.—BUDDE-LUND, Crust. Isop. Terrestria, 1885, pp. 138-141 (see Budde-Lund for further synonymy).—RICHARDSON, Bull. U. S. Nat. Mus., No. 54, 1905, pp. 614-616.

Locality.—Mandeville; about 75 specimens.

PORCELLIONIDES PRUINOSUS (Brandt).

Porcellio pruinus BRANDT, Bull. Soc. Imp. Naturalistes de Moscou, vol. 6, 1833, p. 19.

Metoponorthus pruinus BUDDE-LUND, Crust. Isop. Terrestria, 1885, pp. 169-171 (see Budde-Lund for synonymy).—DOLLFUS, Bull. Soc. Zool. France, vol. 18, 1893, p. 187.—G. O. SÆRS, Crust. Norway, vol. 2, 1899, pp. 184-185, pl. 80, fig. 2.—CHILTON, Trans. Linn. Soc. Lond. (2), vol. 8, 1901, p. 141.—STOLLER, 54th Report New York State Mus., 1902, p. 213.—PAULMIER, Bull. New York State Museum, 1905, pp. 183-184.—RICHARDSON, Bull. U. S. Nat. Mus., No. 54, 1905, pp. 627-629.

Porcellionides pruinus STEBBING, Records of the Indian Museum, vol. 6, pt. 4, No. 12, 1911, p. 189.

Locality.—Mandeville; about 75 specimens.

Family ARMADILLIDIDÆ.

CUBARIS JAMAICENSIS, new species.

Body ovate, nearly twice as long as wide, $9\frac{1}{2}$ mm. by 5 mm. Head and dorsal portion of the thoracic segments covered with low tubercles. The tubercles on each segment are arranged in a transverse row of four about the middle with a group on either side of about nine. On the first segment the lateral groups are composed of about eleven tubercles, and there are also two low tubercles on the anterior portion of the middle dorsal region, one on either side of the median line. There are two tubercles on the terminal abdominal segment, one on either side of the median line at the base of the segment. The color is brown, with a median row of light spots, one on the anterior portion of each segment. There is also a group of light spots on each segment under the lateral group of tubercles.

The head is wider than long, $2\frac{1}{2}$ mm.: 1 mm., with the frontal margin straight and forming a narrow border. The eyes are small, round, and composite. The first pair of antennæ are rudimentary and inconspicuous. The second pair have the first article short; the second about three times as long as the first; the third about twice as long as the first; the fourth is about as long as the second; the fifth is a little longer than the fourth. The flagellum is composed of two articles, the second of which is about three times as long as the first. The prosepistoma is flat.

FIG. 2.—*CUBARIS JAMAICENSIS*.
X 64.

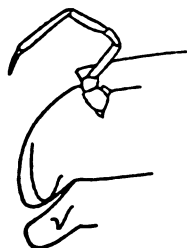


FIG. 3.—*CUBARIS JAMAICENSIS*. UNDER SIDE OF HEAD AND FIRST TWO SEGMENTS OF THORAX SHOWING COXOPODITES.

The first segment of the thorax is about twice as long in the median line as any of those following, which are subequal. The lateral parts of this segment are upturned, the dorsal surface being concave. The lateral parts of the second, third, and fourth segments are produced in narrow processes with rounded extremities. The lateral margins of the last three segments are nearly straight. Coxopodites are present on the first two segments on the under side. On the first segment they occupy only the posterior half of the lateral margin and are smaller than the lateral part of the segment, being

narrower and shorter. The coxopodites of the second segment are small dentiform processes, obliquely placed some distance from the lateral margin.

The first five segments of the abdomen are short and subequal, the first being a little shorter than any of the others. The lateral parts of the first and second segments are covered by the seventh thoracic segment. The sixth or terminal segment is constricted in the middle, and has the posterior margin truncate. The peduncle of the uropoda occupies the space between the terminal segment and the lateral part of the fifth segment. The inner branch is short, not reaching to the extremity of the terminal abdominal segment by some distance. The outer branch is minute and is situated about the middle of the inner margin of the peduncle.

About 30 specimens were collected at Mandeville by Dr. Thomas Barbour.

Types in the Museum of Comparative Zoölogy; cotypes in the United States National Museum.

This species is closer to *Cubaris silvarum* (Dollfus)¹ than to any other described species. It differs from that form in not having the coxopodites of the first thoracic segment distinct on the entire length of the edge, in having the coxopodite of the second segment smaller and more distant from the lateral margin, and in having the tubercles on the body more distinct and differently arranged.

¹ Proc. Zool. Soc. London, 1896 pp. 393-394.

NAUMACHOCRINUS, A NEW GENUS BELONGING TO THE CRINOID FAMILY PHRYNOCRINIDÆ.

By AUSTIN HOBART CLARK,

Assistant Curator, Division of Marine Invertebrates, United States National Museum.

The genus *Phrynocrinus*,¹ based upon a single species described from a single specimen dredged by the United States Fisheries steamer *Albatross* off southern Japan in 1906,² represents a unique type of crinoid structure, though its more or less distant relationship to the genus *Rhizocrinus* is evident. So extraordinary are the characters presented by this animal that at the time of its description a new family, Phrynocrinidæ, was created for its reception.

Recently in looking over some material from the Hawaiian Islands a curious crinoid was found which at first sight appeared to be a *Rhizocrinus* of the *R. rawsonii* type, but with the distal third of the stem of the *Phrynocrinus* type, devoid of radicular cirri and attached to a terminal stem plate. Analysis of the calyx of this new form, however, shows that the calyx, instead of being composed of enormously elongated basals bearing distally small radials as in *Rhizocrinus*, is just the reverse, the very small basals bearing on their distal edge enormously elongated radials. This type of calyx structure is quite unique. Certain species of *Bathycrinus* have very short basals; but in this genus whenever the basals are short they are always fused into a solid ring—and they are never so short as in *Phrynocrinus* and in this new species. The radials of *Bathycrinus*, though usually longer than the radials of *Rhizocrinus*, never become elongated as in this form. Many species of *Rhizocrinus*, and especially of *Bathycrinus*, possess more or less phrynocrinoid distal extremities to the stem, but in all cases they possess radicular cirri, never being attached. But this difference, though interesting, is of no great importance, for in certain groups, and even in single genera, some forms may be free with radicular cirri, while others are attached to a heavy terminal stem plate.

¹ For the author, place and date of publication, derivation, etc., of this and the other crinoid names herein given see Proc. U. S. Nat. Mus., vol. 34, pp. 435-542.

² Proc. U. S. Nat. Mus., vol. 32, p. 507, fig. 1, p. 508.

Though indicating the connection between the genus *Phrynocrinus* and the genera *Rhizocrinus* and *Bathycrinus*, this new genus is evidently much closer to the former than to the two latter, and should be placed with it in the same family.

This is the first stalked crinoid to be described from the Hawaiian Islands; and it is interesting to note that it is so closely related to a Japanese form (*Phrynocrinus*), and, moreover, that it possesses a lesser degree of specialization than the latter;¹ for from the evidence at hand it appears that the crinoid fauna of southern Japan was derived largely from that of the South Sea Island region by way of the Hawaiian Islands, and not from the lands lying directly to the southward.

NAUMACHOCRINUS, new genus.²

Genotype.—*Naumachocrinus hawaiiensis*, new species.

Diagnosis.—Stalk attached distally to a terminal stem plate as in *Phrynocrinus*, entirely without radicular cirri; distal third of stem robust, the columnars resembling those of *Phrynocrinus*, but slightly longer; proximal two-thirds of stem much more slender, resembling that of the larger species of *Rhizocrinus*, such as *R. weberi*.

Calyx cylindrical, greatly elongated, twice as long as broad, resembling in general appearance that of *Rhizocrinus rawsonii* or *R. weberi*; but the basals are exceedingly short, low triangular, over three times as broad as long, just in apposition at their lateral angles, and the radials are enormously elongated, about three times as long as their distal breadth, the relation between these two circlets of plates being just the reverse of that characteristic of *Rhizocrinus*.

NAUMACHOCRINUS HAWAIIENSIS, new species.

Stem.—The stem is 237 mm. long, and is composed of 60 columnars, the distalmost attached to the remains of a heavy terminal stem plate resembling that of *Phrynocrinus*; the distal 75 mm. of the stem is composed of 12 massive columnars of the type characteristic of *Phrynocrinus*, but proportionately longer. The distalmost columnar is 6.5 mm. across the expanded ends, which are very narrowly oval, the long axes being at right angles to each other, and 6.5 mm. long; about its center runs a more or less irregular broad raised band; the following columnars are similar, very slowly decreasing in size, the tenth (from the terminal stem plate) being 4.5 mm. across the very narrowly oval ends and 6 mm. long, and the eleventh 4.5 mm. across the distal and 4 mm. across the proximal end, and 5.5 mm. long; the twelfth is 4 mm. across the distal and 3 mm. across the proximal end, and 4.5 mm. long; the proximal end is very broadly oval, but the distal end is narrowly oval like the proximal end of the eleventh

¹ See Proc. U. S. Nat. Mus., vol. 38, pp. 115-118, and pp. 211-216.

² From ναύμαχος (ναῦς + μάχημα), a marine or sea fighter, + κρίνω, a lily.

to which it is attached; the sides are strongly convex, the maximum height being just above the center; the following columnars are small and short, with strongly and evenly convex sides, 3 mm. long and 2.5 mm. across the ends; their median diameter, at the height of the convexity, is 3 mm.; there is very little difference between the two axes of the ellipses forming their proximal and distal articular faces; after about the twenty-fifth columnar from the terminal stem plate the length begins to increase very gradually and the sides to become parallel, later assuming a slight median concavity like the columnars of the large species of *Rhizocrinus*, the thirtieth from the terminal stem plate being 3.5 mm. in length and 2.5 mm. across the ends, the forty-fourth 4 mm. in length and 2.3 mm. across the ends, the fiftieth 5 mm. in length and 2.3 mm. across the ends; the first three columnars just beneath the calyx are exceedingly short and discoidal, as in *Bathycrinus*, but beyond these the length rapidly increases.

Calyx.—Basals five, resembling those of *Phrynocrinus nudus*, low triangular, slightly over three times as broad as high, in lateral apposition all around the calyx through their slightly blunted lateral angles; their length is 3 mm. to 4 mm., their basal (proximal) width about 1.5 mm.

Radials five, enormously elongated, about three times as long as their distal width, forming a compact cylinder as do the basals of *Rhizocrinus weberi*; each radial is about 5 mm. long in the median line, about 1.5 mm. broad at the base and about 1.7 mm. broad distally, so that the radial circlet is almost a perfect cylinder; its diameter is about 2.5 mm. at the base (the same as that of the basal circlet) and 2.8 mm. distally.

Superposed upon each radial is a first brachial which is about 1.3 mm. in median length and 1.4 mm. broad, the lateral edges straight and parallel, the distal edge straight, the proximal edge strongly convex, corresponding to a strong concavity in the distal edge of the radial as in *Rhizocrinus*.

Locality.—*Albatross* station No. 4187; off Kauai (Hanamaulu warehouse, S. 38° 45', W. 8.1'); depth, 508–703 fathoms; bottom temperature, 40.0° Fahr.; bottom, gray sand and foraminifera. One specimen, the type of the species.

Type.—Cat. No. 29573, U.S.N.M.

NEW PEDICULATE FISHES FROM THE PHILIPPINE
ISLANDS AND CONTIGUOUS WATERS.

By LEWIS RADCLIFFE,¹

Scientific Assistant, United States Bureau of Fisheries.

In the present paper are described a new genus and 16 new species of pediculate fishes collected by the U. S. Fisheries steamer *Albatross* on the Philippine expedition. All of the species described are herein represented by illustrations made from drawings or photographs. The types have been deposited in the United States National Museum.

Family LOPHIIDÆ.

SLADENIA REMIGER Smith and Radcliffe, new species.

Plate 16, fig. 1.

Dorsal II-I, 10; caudal 8; anal 7; ventral i, 5; pectoral 20.

Head large, arched, less depressed than in other lophiids, length measured to anterior margin of gill-opening 2.54 in total length, breadth 1.12 in its length (2.85 in total length), depth 1.54 in its length; body tapering, deeper than broad, ventral surface a little flattened; caudal peduncle short, deep, depth 4.50 in head, length 4.91; eye 6, small, 1.33 in snout; snout 4.50, lateral depressions shallow; mouth moderate, lower jaw projecting about two-thirds diameter of eye beyond upper; maxillary 2.16, reaching vertical from posterior margin of eye; mandible 1.66; nasal tube well developed, apertures opposite one another, the posterior not opening on tip of tube as in *Lophiodes*, upper margin bearing several small filaments; interorbital 6.20, nearly as wide as eye, slightly concave, smooth; preorbital spine represented by a slight knoblike structure covered with skin; upper orbital rim armed with a small blunt spine anteriorly and a long slender, sharp spine posteriorly; occipital spine relatively stout; opercular

¹ In the study of this collection the writer has been associated with Dr. Hugh M. Smith, who becomes joint author of the new genus and species herein described.

bones flexible, humeral spine absent; mandibular teeth few in number, depressible, cardiform, rather small, mainly in two rows, the inner being the larger; two rows of similar teeth, unequal in size, near symphysis of upper jaw, a single series of eight nondepressible teeth on sides of premaxillary; a single canine on each side of vomer and a row of four or five similar teeth on palatines; sides of disk and body with a few small delicate filaments.

First and second dorsal spines close together, near tip of snout, threadlike, their bases overhanging receding edge of lip, first 1.93, second 2.70, the third entirely covered with a loose fold of skin which connects it with the soft dorsal, its base being slightly less than eye diameter from this fin; soft dorsal well developed, its origin much nearer tip of snout than tip of caudal, base 1.74 in head, longest ray 2.70; caudal 1.54, not as broad as long; anal 3.86; pectoral 2.16.

Color in alcohol: Ground color pale drab gray, ventral surface gray, darkest between ventrals and vent; median portion of soft dorsal rays, anal, and ventral surface of pectorals slate-black; caudal slightly dusky; tongue brownish; peritoneum jet black.

Type.—Cat. No. 70263, U.S.N.M., 13.7 cm. in length, taken with a beam trawl at station 5605 (lat. $0^{\circ} 21' 33''$ N.; long. $121^{\circ} 34' 10''$ E.), in Gulf of Tomini, Celebes, at a depth of 647 fathoms.

This species is distinguished from *S. gardineri* of Regan by the shorter head, ventrals and pectorals; by the presence of only three dorsal spines, the first and second close to tip of snout; by having the caudal longer than deep; and by the well-developed supraorbital spines.

LOPHIODES OLIVACEUS Smith and Radcliffe, new species.

Plate 16, fig. 2.

Dorsal 11-1-11-8; caudal 8; anal 6; ventral 1, 5; pectoral 16.

Head large, subcircular, depressed, disk-like, length measured to anterior margin of gill-opening 2.46 in total length; breadth 1.15 in its length, 2.85 in total length; depth 2.46; body conical, tapering, slightly broader than deep; caudal peduncle slender, depth 8.42 in head, length 5.90; eye large, horizontal diameter 5.36, cornea 6.56; snout 4.30, a deep lateral depression on each side; mouth large, lower jaw projecting about three-fourths diameter of eye beyond upper; maxillary 2.18, reaching vertical from middle of eye; mandible 1.40, extending slightly beyond posterior margin of eye; nasal tube bulbous, close to posterior preorbital spine, apertures located as in related species; interorbital 5.36, equal to eye, concave, rugose; preorbital spines two, rather weak, second stronger; upper orbital rim sharp, overhanging, armed with two blunt teeth anteriorly and a spine-like tooth posteriorly; humeral spine bifid, the two points three-fourths diameter of eye apart, the posterior branch on left side bifid, curved inward and upward, that on the right side single, almost

horizontal; all of bony spines of head relatively short and stout; depressible cardiform teeth mainly in three rows on mandible, inner row longest; similar teeth of unequal size near symphysis of upper jaw, mainly in two rows, a single series of 17 small nondepressible teeth on premaxillary posteriorly, the teeth increasing in size from before backward; a pair of strong canines on each side of vomer and a row of 5 to 7 similar teeth on palatines; well-developed filaments on edge of lower jaw and disk, angle of mouth and sides of head, body, and tail; skin thin, not tough.

Dorsal spines plain bristles, excepting the third, which is scantily fringed; first 1.80 in head, its base close to receding edge of lip; second 2.23, close to first; third 1.34, longest, partly concealed at its proximal end, its base being in vertical to posterior margin of eye; fourth 4.37, slender, concealed for nearly a third of its length, its base midway between tip of snout and base of caudal; fifth 5.90, similar to fourth and close to it; dorsal rays subequal, except first

FIG. 1.—LOPHIODES OLIVACEUS. (FROM THE TYPE.)

and last, which are slightly shorter; caudal nearly truncate, an outer simple ray on each side; anal small, its origin under posterior third of dorsal; ventrals small; pectorals 1.80, well developed, some of posterior rays not discernible without dissection.

Color in alcohol: Dorsal surface olivaceous or sepia, ventral surface light gray, densely dotted with minute black points; fins dusky, ventrals similar in color to ventral surface, pectorals similar to adjacent body color, tips light olive; peritoneum jet black.

Type.—Cat. No. 70264, U.S.N.M., 29 cm. in length, taken with a beam trawl at station 5505 (lat. $8^{\circ} 37' 15''$ N.; long. $124^{\circ} 36'$ E.), off northern Mindanao, at a depth of 220 fathoms.

This species is very close to *L. miacanthus* (Gilbert) from the Hawaiian Islands. In the type and two cotypes of the Hawaiian form the pectoral has 21 or 22 rays, while in the Philippine species it normally has 16, the number varying from 16 to 18; the first dorsal spine is grayish instead of black, and the filamentous flaps are fewer in number and not as well developed.

There are over 50 specimens in the collection taken at depths of 83 to 395 fathoms. Although occasionally found with *L. naresi*, the majority of the specimens were taken from greater depths than our examples of the latter species, which came from depths of 83 to 214 fathoms. *L. naresi* is distinguished from *olivaceus* by the better developed dorsal spines, of which there are six, by the position of the third, its base being between the eyes instead of behind them; by the greater concavity of interorbital; by the better developed bony spines of head, and filaments on head, body, and fins. The posterior arm of the humeral spine is usually single and bent upward; in *L. olivaceus* it is usually multifid.

LOPHIODES INFRABRUNNEUS Smith and Radcliffe, new species.

Plate 16, fig. 3.

Dorsal II-I-8; caudal 8; anal 6; ventral i, 5; pectoral 16.

Head large, elliptical, depressed, disklike, length measured to anterior margin of gill-opening 2.62 in total length; breadth 1.21 in head, 3.19 in total length; depth 2.57 in head; body conical, tapering, its

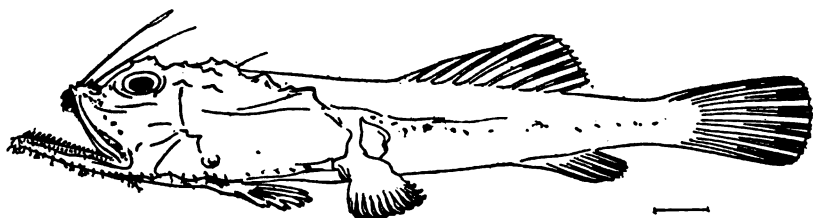


FIG. 2.—*LOPHIODES INFRABRUNNEUS*. (FROM THE TYPE.)

ventral surface flattened; caudal peduncle tapering, nearly as deep as long, 5.88 in head; eye relatively small, its horizontal diameter 5.64, exposed portion of cornea 7.05; snout 5.02, lateral depressions not as deep as in related species; mouth large, lower jaw projecting; maxillary 2.10, reaching vertical from middle of eye; mandible 1.47, extending beyond posterior margin of eye; nasal tube large, bulbous, anterior aperture large, situated on front of bulb, posterior aperture on apex of tube; interorbital 7.05, deeply concave, smooth; preorbital spines two, anterior weakly bifid, posterior long and sharp; upper orbital rim not very pronounced, armed with three blunt teeth; humeral spine strong, bifid, the two points an eye diameter apart, the posterior spine on the left side being bifid, the one on right side single; all of the bony spines of head low and stout; mandibular and maxillary teeth as in related species, 15 in a single series on sides of premaxillary; a single stout canine on each side of vomer and a row of 4 or 5 similar teeth on each palatine bone; filaments on sides of head and body small, few in number; skin thick and tough.

First dorsal spine 2.56, longest, bearing a narrow flap along distal portion; second 2.64, bristle-like; third 4.70, concealed for half its length at its proximal end, its base midway between tip of upper jaw and posterior edge of gill opening; soft dorsal low; caudal 1.66, long, margin nearly truncate; anal small; ventrals well developed; pectoral 2.43 reaching nearly to base of anal.

Color in alcohol: Dorsal surface yellow-brown, ventral surface anteriorly citron brown, becoming dark mesially and blue-black posteriorly; fins blue-black; inside of mouth brownish; peritoneum blue-black.

Type.—Cat. No. 70265, U.S.N.M., 37 cm. in length, taken with a beam trawl at station 5488 (lat. 10° N.; long. $125^{\circ} 6' 45''$ E.), between Leyte and Mindanao, at a depth of 772 fathoms, on a bottom of green mud.

There are 10 specimens in the collection from 9 stations, taken at depths of 270 to 772 fathoms.

This species is distinguished from *L. olivaceus* by the reduced size and number of dorsal spines, the first of which is the longest, the reduced number and size of filaments, the smaller eye, the coloration, especially that of the ventral surface, and the thicker, tougher skin. It normally occurs at a greater depth than the other species of the genus taken in the Philippines. In small examples the dorsal surface is raw sienna, dotted with small light gray spots.

Family ANTENNARIIDÆ.

ANTENNARIUS ROSACEUS Smith and Radcliffe, new species.

Plate 17, fig. 2.

Dorsal III-12; caudal 9; anal 8; ventral 6; pectoral 10.

Head deeper than long, length measured to anterior margin of gill-opening 1.86 (2.53 in total length), breadth 1.25 in its length; body 1.80 (2.45 in total), compressed; caudal peduncle very short, compressed, depth 3.40 in head, length 5; eye 7 in head, 1.31 in snout; snout 6; mouth broad, nearly vertical; lips fleshy; bands of small teeth in jaws and palatines; tongue large, fleshy; maxillary 2.50, nearly concealed under skin, reaching vertical to anterior margin of eye; mandible large, fleshy knob at symphysis well developed; nostrils circular, well separated, with round fleshy rims; interorbital 3.94, depressed, flat; head, body, and fins covered with small excrescences ending in small spinules; pores on head and upper side of back with rough excrescences, very distinct.

First dorsal spine (bait) 1.76, long, slender, bristlelike, ending in a spongy trident, tip reaching beyond middle of third dorsal spine; second spine 1.66, basal third stout, cylindrical, distal portion slender spiral-like, with rough excrescences, and ending in a filament; third

nearly as long as second, a shallow pit in front of it, spine erect, concealed by skin, adnate to top of head; soft dorsal well developed, posterior rays longest 2, base of fin as long as head, fin rounded posteriorly, tips reaching beyond base of caudal, last three rays divided, others simple; caudal 1.50, rounded; anal 2, rounded; ventrals 2.50, short, broad; pectorals 1.10, tips reaching nearly to posterior base of anal.

Color in alcohol: Ground color salmon, ventral surface white; a black ocellus about twice size of eye on base of eighth and ninth dorsal rays and adjacent portion of body; a similar light-colored ocellus margined with dusky brown on upper part of caudal peduncle near base of dorsal; a similar ocellus below and slightly anterior to black blotch; dusky markings on head and body anteriorly, most distinct on tip of third dorsal spine, first and second dorsal rays, and sides between the two and on base of pectoral; soft dorsal bright salmon with dusky markings posteriorly, tips of rays whitish; other fins similar with dusky markings, most distinct near margins; some indistinct dusky lines radiating from eye.

Type.—Cat. No. 70266, U.S.N.M., 3.8 cm. in length, from Romblon, taken from ship's side at night, attracted by electric light suspended in water.

ANTENNARIUS ALTIPINNIS Smith and Radcliffe, new species.

Dorsal III-12; anal 7; ventral 6; pectoral 9.

Head as deep as long, length measured to anterior margin of gill-opening 1.87 (2.62 in total length), breadth 1.11 in its length; body compressed, its depth 1.76 (2.47 in total length); caudal peduncle short, compressed, depth 2.85 in head, length 5.33; eye 10 in head, 2.50 in snout, very small; snout 4; mouth large, oblique; jaws subequal; maxillary 2.66, partially concealed in skin; nostrils circular, with round fleshy rim; interorbital 3.20, arched; head, body, and fins covered with small excrescences with small spinules at tip; pores on head and back very indistinct.

FIG. 3.—*ANTENNARIUS ALTIPINNIS*. (FROM THE TYPE. ENLARGED THREE DIAMETERS.)

First dorsal spine (bait) 6, short, bristlelike, ending in a short spongy club-shaped structure placed at right angles to main axis; second spine 3.60, rather stout, covered with rough excrescences, ending in a filamentous tip which reaches base of third spine; third 2,

adnate to dorsal surface; soft dorsal high, the rays of nearly uniform length, 1.81, base of fin longer than head, the last six rays divided; caudal 1.33, margin rounded; anal 1.81, deep; ventrals 2.16, all of the rays simple; pectorals 1.33, tips reaching beyond insertion of anal.

Color in alcohol: Ground color dark brownish green, shading into purple, scantily mottled with brownish yellow; tips of fins lighter; a black blotch at base of eighth dorsal ray; slight traces of a brownish band across base of caudal.

Type.—Cat. No. 70267, U.S.N.M., 2.1 cm. in length, from Nogas Point, Panay, taken in tide pool with copper sulphate.

ANTENNARIUS SUBTERES Smith and Radcliffe, new species.

Plate 17, fig. 1.

Dorsal III-12; anal 7; ventral 5; pectoral 9.

Head as deep as long, length measured to anterior margin of gill-opening 1.80 (2.24 in total length); breadth 1.77 in its length; depth of body 1.80 (2.24 in total length); caudal peduncle long, slender, compressed, depth 5, length 4.33; eye 10 in head, 2 in snout, inconspicuous; snout 5; mouth oblique; jaws subequal; teeth on jaws long, depressible; similar teeth on vomer and palatines; tongue large, fleshy; maxillary 2.60, reaching vertical to middle of eye; nostrils circular, close together, fleshy rim little developed; interorbital 4.33; skin comparatively smooth, slender spinules protruding through in places, most abundant on second and third dorsal spines and ventral surface, those on head and body inconspicuous but noticeable when the finger is passed forward over the body.

First dorsal spine (bait) 5, basal half bristle-like, distal portion enlarged, spongy; second spine 2.80, long, slender, not adnate to dorsal surface, armed with well-developed spinules; third as long as second, adnate to back; dorsal rays small, all except tips covered with a coating of smooth tough skin, last three rays divided; caudal 2.27, narrow, rounded; anal similar to soft dorsal; ventrals 5, very small; pectorals 2.27, small.

Color in alcohol: Ground color purplish brown with yellowish gray mottlings; distal portion of vertical fins dark purplish brown, with light edging; dorsal surface of tongue with gray and brownish mottlings; peritoneum white.

Type.—Cat. No. 70268, U.S.N.M., 5.6 cm. in length, taken with a beam trawl at station 5442 (lat. 16° 30' 36'' N.; long. 120° 11' 06'' E.), Lingayen Gulf, west coast of Luzon, at a depth of 45 fathoms, on a bottom of coral sand.

Family CERATIDÆ.

DERMATIAS Smith and Radcliffe, new genus.

Body short, deep, compressed, slightly elevated. Head large, subquadrangular, a long, deep, longitudinal trough on forehead; snout broad and blunt; mouth moderate, nearly horizontal, the mandible projecting but slightly, bearing a strong bifid spine at its posterior end; teeth depressible, cardiform, mainly in one row; vomerine teeth present; no palatine teeth; eyes lateral. Illicium short, two-jointed, the basal joint procumbent; a second nonfunctional dorsal spine on head, entirely concealed by skin, soft dorsal and anal moderate, more or less hidden by skin; caudal large; ventrals absent. Skin naked, very loose, and soft. Gill-openings large, below axil of pectorals.

This genus appears to be more closely related to *Dolopichthys* of Garman than to any of the other ceratiids. The form of head and body and of the illicium and the better developed fins are distinctive.

Type species.—*Dermatias platynogaster*.

DERMATIAS PLATYNOGASTER Smith and Radcliffe, new species.

Plate 17, fig. 3.

Dorsal 1-(1)-7; caudal 9; anal 4; pectoral 15.

General form compressed, irregular, dorsal surface with slight curvature, ventral surface greatly decurved, the very large stomach hanging down like a great pouch; head large, subquadrangular, ridged, its length measured to anterior margin of gill-opening 2.14 (2.90 in total length); body compressed, depth when stomach is empty 1.55 (2.10 in total length); caudal peduncle very deep, depth 2 in head; eye minute, buried beneath a circular patch of transparent unpigmented skin, situated in a broad depression between supra-orbital ridge and premaxillary, its diameter 6.66 in snout; snout 3.19, truncate at tip, as broad as long; mouth moderate, nearly horizontal; maxillary 1.91, reaching considerably beyond vertical from posterior margin of eye; mandible 1.48, projecting but slightly, a fleshy knob below tip, posteriorly ending in a stout bifid spine, the larger spinule curved outward; nasal tube elongate, below level of eye, on anterior prolongation of supraorbital ridge; interorbital 4.85, deeply concave, the longitudinal trough extending from tip of snout nearly to occiput; a preorbital knoblike structure, covered by skin, lies in front of nasal tube, a strong trenchant ridge extends backward over eye, ending in a strong outwardly curved spine; teeth in jaws mainly in one row, depressible, cardiform, those in upper jaw quite irregular; a stout canine on each side of vomer; skin of head and body smooth; gill-opening represented by a broad curved slit, lying below base of pectoral.

Illicium jointed, base being between eyes, basal joint almost entirely concealed, rodlike, procumbent, reaching nearly to tip of snout, distal joint free, 2 in head, the bulblike tip surmounted by many short, fingerlike filaments; second dorsal spine entirely concealed by skin, its base midway between tip of snout and gill-opening, its tip recurved, attached; second dorsal elongate, scarcely separated from caudal, its rays simple, all but tips concealed by skin; caudal base very broad, rays well separated, distal margin rounded; anal similar to second dorsal; membrane connecting caudal rays and tips of dorsal and anal rays very thin, transparent; ventrals absent; pectorals 1.97, rather small, on level with mouth.

Color in alcohol: Ground color seal brown, darkest on belly; caudal light gray, other fins body color; distal joint of first dorsal spine blackish mesially, bulb white with darker shades underneath, filaments white, tipped with black; peritoneum brownish black; stomach mouse gray, dotted with darker; inside of mouth with brownish shades.

Type.—Cat. No. 70269, U.S.N.M., 18.2 cm. in length, taken with a beam trawl at station 5463 (lat. $13^{\circ} 40' 57''$ N.; long. $123^{\circ} 57' 45''$ E.), near Sialat Point Light, east coast of Luzon, at a depth of 300 fathoms.

Family OGCOCEPHALIDÆ.

MALTHOPSIS OCELLATA Smith and Radcliffe, new species.

Plate 18, fig. 1; plate 19, fig. 1.

Dorsal 5; caudal 9; anal 2; pectoral 12; ventral 5.

Head large, triangular, broader than long, measured to gill-opening 1.88 (2.34 in total length), breadth at base of spine at angle equal to its distance from tip of rostral spine, 1.65 in body; rostral angle about 72° ; body conical, tapering, depth 6.30; caudal peduncle slender, depth 7, length 3.36; eye 4.66, large, lateral; snout measured to tip of rostral spine 6.46; mouth small, gape 4.66; jaws subequal; anterior nostril circular, posterior large, slitlike; interorbital 7, concave; skin of dorsal surface with many small dermal ossicles, some of these enlarged, platelike, quite regular in their arrangement, the median dorsal row especially well developed and becoming double within an eye diameter of eye and posteriorly near insertion of dorsal; there are three rows of dermal plates along edge of disk, the upper row dilated near eye, thence curved downward to maxillary; the second extends to gape of mouth, the third meets its fellow below tip of mandible; two well-developed rows along ventral surface behind vent, not interspersed with small ossicles; an area on either side of this row mesially in which the ossicles are scattered or absent; on ventral surface a region in front of ventrals, from between ventrals backward on either side of vent to posterior edge of disk with small dermal plates, rest of ventral surface of disk naked; ro-

tral spine short, nearly horizontal; spiny structure at angle extending outward at right angles to axis of body, covered with ossicles, a well-developed spine at its tip directed forward.

Rostral tentacle short, dilated at tip; dorsal 3.83, base very short, scarcely more than half diameter of eye; caudal 2.21, rounded; anal 3.50, base not equal to diameter of pupil; ventrals equal to caudal; pectorals beyond wrist 2.40.

Color in alcohol: Ground color above wood-brown, with 8 black rings on each side median line of head; ventral surface cream-buff; dorsal dusky, other fins very light cream-buff, almost white; peritoneum silvery.

Type.—Cat. No. 70270, U.S.N.M., 9.8 cm. in length, taken with a beam trawl at station 5393 (lat. $12^{\circ} 03' 30''$ N.; long. $124^{\circ} 03' 36''$ E.), between Samar and Masbate, at a depth of 136 fathoms, on a bottom of hard sand.

This species is distinguished from *M. lutea* (pl. 18, fig. 2; pl. 19, fig. 2) by the better development of the dermal plates, which are larger and arranged with greater regularity; plates on ventral surface of disk confined to restricted areas, rest of surface smooth; the rostral spine is relatively shorter; spine at posterior angle of disk directed outward, with a forward projecting spinule at tip. In *M. triangularis* (pl. 18, fig. 3; pl. 19, fig. 3) there are more large dermal plates scattered over surface of disk, those on ventral surface much enlarged, the region lying between vent and ventrals entirely paved; rostral spine directed upward, spine at posterior angle ending in four transparent spinules.

This is the most abundant species in the collection, taken at depths of 38 to 425 fathoms. All of the adult specimens have the black rings on dorsal surface; the young do not, though many of them possess brown markings. An isopod infests the branchial region just inside aperture of several specimens.

Color in life of a specimen 7.2 cm. in length from station 5315: Cinnamon brown with a series of three or four black-rimmed ocelli, scarcely as large as pupil, on either side of median ridge; other areas of darker brown present, this giving an obscure mottled effect; ventral region in front of pectorals and ventrals reddish brown.

HALICMETUS RETICULATUS Smith and Radcliffe, new species.

Plate 20, fig. 2; plate 21, fig. 2.

Dorsal 3; caudal 9; anal 4; ventral 5; pectoral 12.

Head broader than long, depressed, anterior margin broadly rounded, length measured to anterior margin of gill-opening 1.97, breadth 1.33, depth 2.75 in its length; body short, tapering, length exclusive of caudal 2.03; eye 6.60, small; snout 7.32; mouth small, jaws subequal; villiform bands of teeth on jaws, vomer, palatines

and tongue; maxillary 5.50; nostrils small, in front of rostrum, anterior with a low rim or tube; interorbital 6.71, not as wide as horizontal diameter of eye, flattened, a slight ridge over each eye; rostrum slightly arched, scarcely projecting beyond anterior margin of eye; tentacular cavity small, its width scarcely more than half diameter of eye, illicium with lower lobes united, upper lobe narrow, bifurcate; rostral spine obsolete; lateral spines at angle of disk small, armed with small spinules; tubercles on sides of disk and on body of moderate size, platelike, those on dorsal and ventral surface of disk small, like shagreen; lateral row of plates on disk armed with small spinules; gills two, as in *Malthopsis*.

Dorsal represented by three small rays, its origin considerably nearer tip of caudal than tip of snout; caudal 2.54, well developed; anal small, its base entirely behind base of dorsal; ventrals 3.30, moderate; pectorals 2.27, short.

Color in alcohol: Ground color light olive brown, crossed by narrow light-colored reticulating lines, bars, and spots; ventral surface and fins cream buff.

Color in life: Pale olive with a reddish wash, reticulating lines white.

Type.—Cat. No. 70271, U.S.N.M., 7.8 cm. in length, taken with a beam trawl at station 5118 (lat. $13^{\circ} 48' 45''$ N.; long. $120^{\circ} 41' 51''$ E.), off Sombrero Island, southern Luzon, at a depth of 159 fathoms, on a bottom of dark green mud.

This species is easily distinguished from *H. ruber* (pl. 20, fig. 3; pl. 21, fig. 3) by the broader, more bluntly rounded and depressed disk (in individuals of the same length the disk in *H. ruber* is only about three-fourths as wide as in this species). The dorsal consists of two or three small, slender rays. In our examples of *H. ruber* no rays are visible on the surface. Brauer,¹ however, records specimens having two or three small dorsal rays.

There are five examples in the collection 5.4 to 7.8 cm. in length from depths of 159 to 200 fathoms.

HALIEUTOPSIS VERMICULARIS Smith and Radcliffe, new species.

Plate 20, fig. 1; plate 21, fig. 1.

Dorsal 5; caudal 9; anal 4; ventral 5; pectoral 15.

Head broad, depressed, subcircular, length measured to anterior margin of gill-opening 1.73, breadth 1.56, depth 2.92 in its length; body short, slender, tapering, its length exclusive of caudal 2.38; eye 6.30, small; snout 6.10; mouth moderate, jaws subequal; narrow bands of villiform teeth on jaws, palate and tongue edentulous; maxillary 4.30; nostrils moderate, lying in a depression on lower

¹ Brauer, Die Tiefsee-Fische, 1906, p. 327.

in of rostrum, anterior with a raised margin, the two a very thin membrane; interorbital 7, flat, narrower than rostrum arched, projecting beyond jaws for a distance equals diameter of eye; tentacular cavity large, as wide as rostrum, protractile, ending in two large globular lobes and a small median lobe; rostral spine moderate, pointing obliquely forward; dorsal surface with stellate tubercles, each with a long slender spine; scattered among the larger tubercles are smaller ones; the large tubercles on the sides of the disk with bifid or trifid spinules; ventral surface of disk naked with small tubercles on area between base of pectorals and vent;

developed, its origin midway between middle of eye and dorsal fin, longest ray 3.47; caudal 2.15, margin rounded; insertion of posterior base of dorsal, longest ray 3.31; ventrals 12.15.

Color: Ground color olive gray with olive vermiculations; white spots on ventral surface.

Remarks: Ground color bottle green tinged with olivaceous, dusky.

No. 70272, U.S.N.M., 8 cm. in length, taken with a haul at station 5365 (lat. 13° 44' 24" N.; long. 120° 45' 30" E.) in Luzon Bay, Luzon, in 214 fathoms.

BRANCHIUS STELLIFER Smith and Radcliffe, new species.

Plate 22, fig. 2; plate 23, fig. 2.

Caudal 9; anal 4; ventral 5; pectoral 15. Head as broad as long, elliptical, disk moderately arched, dorsal fin to anterior margin of gill-opening 1.82, breadth 1.92, equals its length; body moderate, tapering, length exclusive of head 5.58; eye 5.58 in head, 1.57 in interorbital; snout 4.88; mouth large, jaws subequal; narrow bands of villiform teeth on upper and lower jaws and tongue edentulous; maxillary 3.90; nostrils with a membranous arch separating the two apertures; interorbital 7, flat; rostrum high, scarcely projecting beyond vertical; tentacular cavity large, higher than wide, its length equals diameter of eye; illicium protractile, ending in two large lobes and a narrow bifurcate lobe; dorsal surface covered with stellate tubercles, those on anterior part of head and sides of head, each capped with a long slender spine, those on sides of head with a long slender spine and spines at angles of disk small, not much larger than those along sides of disk, those on ventral surface small, two.

Developed; insertion of dorsal midway between tip of snout and dorsal fin, longest dorsal ray 3.54; caudal 2.05 (4.73

in total length), elongate, margin rounded; anal 3.54, its insertion under or slightly behind posterior base of dorsal; ventrals 2.93; pectorals 1.85, reaching nearly to caudal.

Color in alcohol: Dusky olivaceous; caudal margined with blackish above and below, basal portion of median rays white, becoming sepia distally; other fins brownish black.

Type.—Cat. No. 70273, U.S.N.M., 9 cm. in length, taken with a beam trawl at station 5660 (lat. $5^{\circ} 36' 30''$ S.; long. $120^{\circ} 49' 00''$ E.), in Flores Sea, off the coast of Celebes, at a depth of 692 fathoms, on a bottom of gray mud and sand.

From *D. nasutus* (pl. 22, fig. 3; pl. 23, fig. 3) this species differs in having the disk narrower, much more elevated and heavier, and the framework much less cartilaginous.

DIBRANCHUS SIMULUS Smith and Radcliffe, new species.

Plate 22, fig. 1; plate 23, fig. 1.

Dorsal 6; caudal 9; anal 4; ventral 5; pectoral 15.

Head not as broad as long, elliptical; disk rather strongly arched, length measured to anterior margin of gill-opening 1.58, breadth 1.71, depth 2.56 in its length; body, exclusive of caudal, 2.71, rather short; eye 5.82, lateral; snout 4.55; mouth large, jaws subequal; teeth on jaws villiform; palate and tongue edentulous; maxillary 3.72; nostrils conspicuous, on anterior margin of rostrum, a thin membranous arch separating the two apertures; interorbital 3.28, broad, slightly arched; rostrum moderate, projecting beyond jaws, the anterior margin bent downward until the tentacular aperture is barely equal to diameter of eye, its height being about one-half its width; the tentacular cavity extending backward nearly to middle of eye; from its posterior base springs the illicium, which is projected forward, reaching the tentacular aperture, tip trilobate, each lobe composed of a mass of spongy filaments; tubercles stellate, relatively small, unequal, each capped with a long slender spine; tubercles on rostrum, sides of disk and body not so well developed as in related species; spines on rostrum and at angles of disk obsolete; ventral surface of disk naked, except for a few small tubercles in axil of pectoral; tubercles on dorsal surface of body small, widely separated, a distinct naked area around gill-aperture; gills two.

Fins well developed; insertion of dorsal midway between anterior margin of eye and tip of caudal, longest ray 3.42; caudal 1.95, distal margin truncate; base of anal entirely behind base of dorsal, longest ray 3.72; ventrals 3.16, well developed; pectorals 2.05, tips reaching half way between posterior base of anal and base of caudal.

Color in alcohol: Light olivaceous; ventral surface white, washed with vinaceous buff; anal, ventral and lower base of pectoral, white; rest of fins dusky.

pe.—Cat. No. 70274, U.S.N.M., 8.6 cm. in length, taken with a trawl at station 5283 (lat. $13^{\circ} 48' 30''$ N.; long. $120^{\circ} 28' 40''$ near Malavatuan Island, southern Luzon, at a depth of 280 ms, on a bottom of dark gray sand.

s species agrees with *D. nudiventer* of Lloyd in having the ventral surface of disk nearly devoid of tubercles, but differs markedly in

The armature is weak, and the subopercular processes and anal spine are obsolete, as in *Dibranchopsis* of Garman.

Genus CŒLOPHRYS Brauer.

Under this genus we have included those species characterized by the anterior position of the branchial aperture and short body; head more arched and less disk-like than in the typical *Dibranchia*; the tubercles in most species small, prickle-like, giving the fish a prickly appearance; the ventrals small. Its differences from *Dibranchia* are so slight as to suggest the necessity of degrading it to subgeneric rank. *Dibranchus micropus* Alcock (pl. 26, fig. 1; pl. 27, fig. 1) should be included in the genus.

CŒLOPHRYS MOLLIS Smith and Radcliffe, new species.

Plate 24, fig. 1; plate 26, fig. 5; plate 27, fig. 5.

Dorsal 6; caudal 9; anal 4; ventral 5; pectoral 15.

Head large, subcircular, its length measured to anterior margin of gill opening 1.38, breadth equal to length, depth 2.10 in its length; snout short, slender, tapering; length exclusive of caudal 3.63; eye large; snout 3.50, broad; mouth large, nearly horizontal, jaws equal; teeth in jaws villiform; palate and tongue edentulous; operculum 3; nostrils small, on side of rostrum opposite middle of interorbital 3, broad, depressed; rostrum depressed, truncate; opercular cavity as wide as interorbital, low, and shallow; illicium sessile, tipped with two lateral lobes and a broad, fleshy flap above; tubercles small, closely packed, apical prickles elongate; those along edge of disk Y-shaped; tubercles on ventral surface slightly smaller, anal prickles shorter.

Position of dorsal nearer tip of snout than tip of caudal, rays very slender; caudal 2.10, narrow; base of anal not entirely behind base of dorsal, rays slender; ventrals 5.23, very small; pectorals 2.47, longer than double the length of ventrals, tips reaching beyond base of caudal.

Color in alcohol: Cream white; edges of disk, margin of gill-opening, base of pectorals dusky black; ventrals blackish, tips whitish.

pe.—Cat. No. 70275, U.S.N.M., 3.9 cm. in length, taken with a trawl at station 5348 (lat. $10^{\circ} 57' 45''$ N.; long. $118^{\circ} 38' 15''$ in Palawan Passage, at a depth of 375 fathoms, on a bottom of sand.

CŒLOPHRYX ARCA Smith and Radcliffe, new species.

Plate 24, fig. 2; plate 26, fig. 4; plate 27, fig. 4.

Dorsal 5; caudal 9; anal 4; ventral 5; pectoral 15.

Head box-shaped, widest in front of pectoral base, strongly arched, length measured to anterior margin of gill-opening 1.23, breadth 1.47, its depth 1.71 in its length; body very short, the whole fish having the general appearance of some of the trunk-fishes; length of body exclusive of caudal 5.36; eye 5.33, large, lateral; snout 4.80, broad; mouth large, slightly oblique, jaws subequal; villiform teeth on jaws; palate and tongue edentulous; maxillary 3; nostrils prominent, on level of lower half of eye, anterior aperture tubular, posterior slit-like; interorbital 2.28, broad, depressed, extending obliquely downward to broad truncate margin of rostrum; incised truncate front margin of rostrum in vertical to tip of jaws, angles projecting slightly; the low tentacular cavity wider than eye, extending backward to posterior margin of pupil; illicium short, protractile, reaching scarcely more than half way to aperture, median lobe ending in a bifurcate tip; tubercles stellate, fewer than in related species, the prickles being so much farther apart that the furry appearance is largely lost; prickles on lateral plates mostly bifid, those on ventral surface small, separate.

With the exception of the ventrals, the fins are well developed; insertion of dorsal midway between posterior margin of eye and tip of caudal, longest ray 3.87; caudal 2.28, margin rounded; anal scarcely separated from caudal, longest ray 3.87; ventrals 6.86, poorly developed, less than a third of the length of pectorals; pectorals 2.18.

Color in alcohol: Creamy; tubercular spines along edge of disk and basal two-thirds of ventrals blackish.

Type.—Cat. No. 70276, U.S.N.M., 4.1 cm. in length, taken with a beam trawl at station 5295 (lat. 13° 33' 15'' N.; long. 121° E.), in Verde Island Passage, near Escarceo Point, at a depth of 231 fathoms, on a bottom of gray sand.

CŒLOPHRYX BREVIPES Smith and Radcliffe, new species.

Plate 25, fig. 2; plate 26, fig. 2; plate 27, fig. 2.

Dorsal 6; caudal 9; anal 4; ventral 5; pectoral 13.

Head long, strongly arched, greatest breadth equaling the greatest depth, length measured to anterior margin of gill-opening 1.24, breadth 1.80; body very short, length exclusive of caudal 4.62; eye 4.83, large, lateral; snout 4.14, narrow; mouth large, horizontal, jaws subequal; villiform teeth on jaws; palate and tongue edentulous; maxillary 3.22; nostrils well developed, on level with lower half of eye, apertures separated by a thin membranous skin; interorbital 2.90, convex; tentacular aperture large, nearly as high as long, its width equaling horizontal diameter of eye, cavity spacious, extend-

ing backward to posterior margin of eye; the trilobate tip of illicium entirely closing tentacular aperture, the two lower lobes thick and fleshy, the upper thinner, membranous, with a series of short filaments along its outer edge; skin soft, covered with small prickles.

Insertion of dorsal nearer tip of caudal than posterior margin of eye, its base nearly reaching base of caudal; caudal 1.93; anal small, its base nearly reaching base of caudal; ventrals 6.44, small, slightly more than one-third length of pectorals; pectorals 2.23.

Color in alcohol: Anterior half of head, body behind gill-openings, vertical fins and pectorals cream color; rest of head clove brown, darkest on ventral surface; basal half of ventrals brown, tips white; a slight brownish shade on anterior pectoral rays distally.

Type.—Cat. No. 70277, U.S.N.M., 5.1 cm. in length, taken with a beam trawl at station 5658 (lat. $3^{\circ} 32' 40''$ S.; long. $120^{\circ} 31' 30''$ E.), Gulf of Boni, Celebes, at a depth of 510 fathoms, on a bottom of gray mud.

This species closely resembles *C. brevicaudata* of Brauer, but differs in having the head much shorter and deeper. The collection contains a single other example from station 5238, east coast of Mindanao, taken at a depth of 380 fathoms, on a bottom of green mud.

CCELOPHRYS OBLONGA Smith and Radcliffe, new species.

Plate 25, fig. 1; plate 26, fig. 3; plate 27, fig. 3.

Dorsal 5; caudal 9; anal 4; ventral 5; pectoral 15.

Head narrow, elongate, not disk-like, nearly as high as wide, length measured to anterior margin of gill-opening 1.55, breadth 2.93 (1.89 in its length), depth 2.22 in its length; body tapering, its breadth at gill-opening about one-half breadth head at base of pectoral, its length exclusive of caudal 2.82; eye 7, small; snout 4.90; mouth large, oblique, jaws subequal; teeth in jaws villiform; palate and tongue edentulous; maxillary 3.26; nostrils small, on anterior margin of rostrum opposite middle of eye; interorbital 4.23, broad, flat; rostrum very small, not elevated; tentacular cavity very small and shallow, trilobate tip of illicium entirely closing the aperture; tubercles small, closely packed, each capped with a long slender prickle; those along margin of disk bifid or multifid; prickles so small and numerous as to give a furry appearance to the skin, those on ventral surface slightly smaller than on the dorsal; subopercular processes and rostral spine obsolete.

Insertion of dorsal midway between tip of snout and tip of caudal, rays very slender; caudal 1.63, margin slightly rounded; anal base entirely behind base of dorsal; ventrals 2.72, small, about three-fifths length of pectorals; pectorals 1.75, reaching base of caudal.

Color in alcohol: Dusky olivaceous; fins with blackish margins, central basal portion whitish, except the ventrals, which are black.

Type.—Cat. No. 70278, U.S.N.M., 5.3 cm. in length, taken with a beam trawl at station 5607 (lat. $0^{\circ} 04' 00''$ S.; long. $121^{\circ} 36' 00''$ E.), near Binang Unang Island, Gulf of Tomini, Celebes, in 761 fathoms, on a bottom of fine sand.

1. *SLADENIA REMIGER*. (PAGE 199.) FROM THE TYPE.

2. *LOPHIODES OLIVACEUS*. (PAGE 200.) FROM THE TYPE.

3. *LOPHIODES INFRABRUNNEUS*. (PAGE 202.) FROM THE TYPE.

1. ANTENNARIUS SUBTERES. (PAGE 205.) FROM THE TYPE.

2. ANTENNARIUS ROSACEUS. (PAGE 203.) FROM THE TYPE.

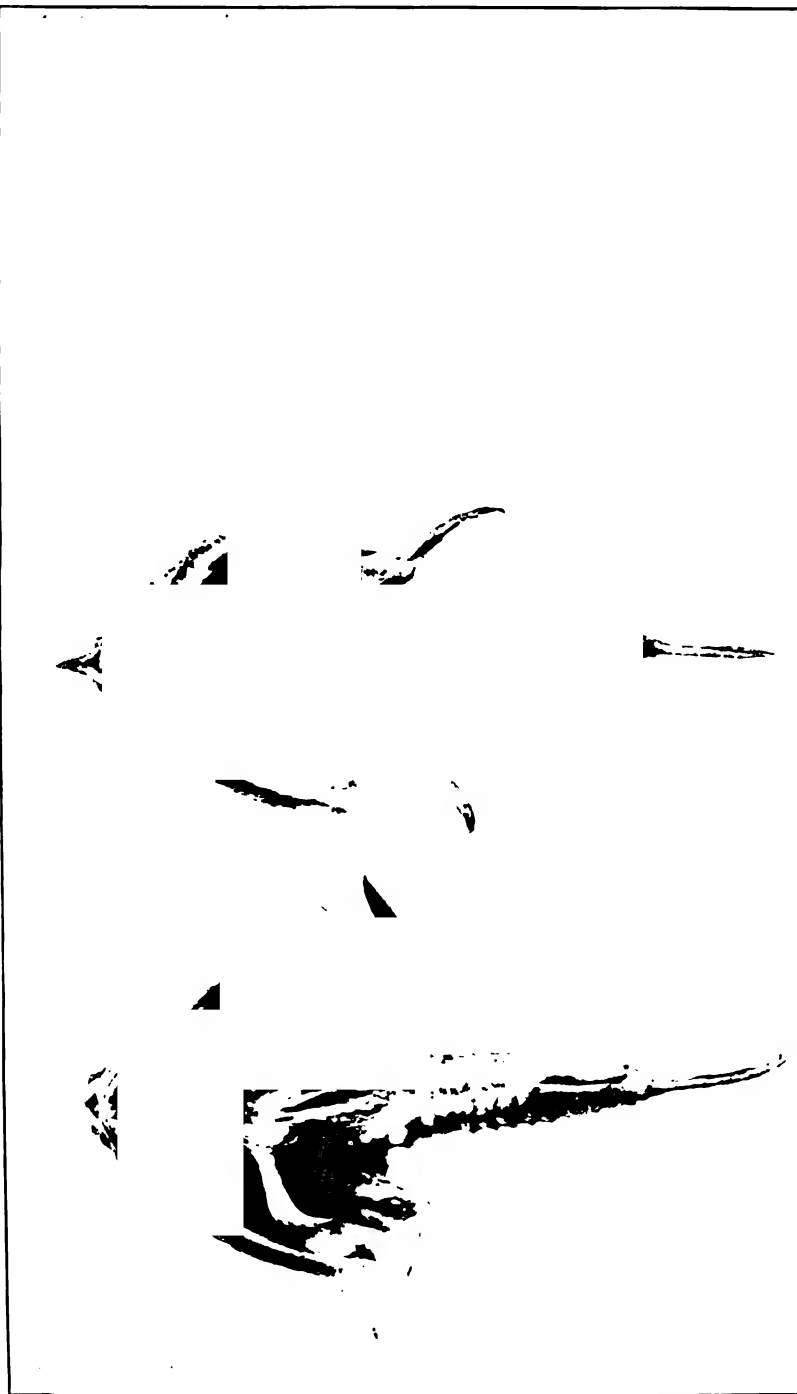
3. DERMATIAS PLATYNOGASTER. (PAGE 206.) FROM THE TYPE.

1

2

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1. MALTHOPSIS OCELLATA. (PAGE 207.) FROM THE TYPE. DORSAL VIEW.
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OSMLA,

NAMES APPLIED TO BEES OF THE GENUS *OSMIA*, FOUND IN NORTH AMERICA.

By T. D. A. COCKERELL,
Of the University of Colorado, Boulder.

This list is prepared in the same manner as the paper on the genus *Nomada*, which appeared in these Proceedings, vol. 41, pp. 225-243. Our knowledge of *Osmia* in America has very greatly increased in recent years, and in the absence of a catalogue it has been difficult to keep the numerous species in mind. Friese's revision of the Megachilidæ of the world, published in Das Tierreich, November, 1911, includes the Nearctic Osmiæ, but unfortunately the manuscript was prepared ten years ago, and has not been brought up to date; it thus falls very far short of representing our present knowledge, although very valuable as far as it goes.

According to Titus,¹ the type of *Osmia* Panzer is *O. rufa* (Linnæus). The only American species which he considers strictly congeneric with *rufa* are *O. lignaria* and *O. propinqua*. The genus is here interpreted in a broader sense, in accordance with the more usual custom. Robertson divides *Osmia* into a number of genera, but restricts the name *Osmia* to such species as *O. brevis*, *pumila*, *cobaltina*, and *atriventris*, applying the name *Ceratostomia* (Thomson 1872) to the *Osmia*, s. str. of Titus. Ashmead, however, recognized *Amblys* Klug (type, *bicornis*, which = *rufa*) as a genus distinct from *Ceratostomia*; he considered *Helicosmia* (the group of *O. aurulenta*, *bicolor*,² etc.) to be identical with *Amblys*.

The genus *Osmia* is very rich in species throughout the temperate portions of the Northern Hemisphere. The American forms are mostly blue or green, some very brilliant, while those of Europe average much darker, with a much larger proportion of actually black

¹ Journ. N. Y. Ent. Soc., 1904, p. 26.

² *Apis bicolor* Schrank (= *Osmia bicolor*) and *Apis bicolor* Fabricius (= *Megachile bicolor*) were both published in 1781; I do not know which has priority. Should Fabricius have priority, then *Osmia bicolor* would become *Osmia rustica* (*Apis rustica* Fourcroy 1785), which would make *O. rustica* Cresson a homonym.

insects. On the other hand, the pubescence of the Old World *Osmia* is often very brightly colored, *O. ferruginea* and *O. pseudoaurulenta* from North Africa being covered with deep-red hair. The European species not rarely have red hair on the abdomen, while in the American, if there is such hair, it is on the thorax, or mainly so (see *O. novomexicana*, *O. cerasi*).

A species of *Osmia*, agreeing with the description of *O. texana* Cresson, was taken by Prof. C. H. T. Townsend on the Rio Nautla, State of Vera Cruz, in the tropical part of Mexico.

SUBGENERA AND SECTIONS.

Centrosmia ROBERTSON.

Type.—*bucephala*. Also includes *tarsata*.

Xanthosmia ROBERTSON.

Type.—*cordata*. Mandibles of female quadridentate.

Gnathosmia ROBERTSON.

Type.—*georgica*. Mandibles of female with a large basal tooth.

Monilosmia ROBERTSON.

Type.—*canadensis*. Also includes *chlorops*. Male flagellum moniliform.

Diceratosmia ROBERTSON.

Type.—*quadridentata*. This and *Nothosmia* have tridentate mandibles in the female.

Leucosmia ROBERTSON.

Type.—*albiventris*. Also includes *nigritula*.

The above six, and also *Ceratosmia*, are defined in Trans. Amer. Ent. Soc., 1903, pp. 165-166.

Nothosmia ASHMEAD.

Type.—*distincta*. Also includes *exigua*, according to Titus.

Acanthosmioides ASHMEAD.

Type.—*odontogaster*.

For the above two see Trans. Amer. Ent. Soc., 1899, pp. 75-76.

Melanosmia SCHMIEDEKNECHT 1884. To this group Titus has referred *O. grandior*.

TABLES.

- (1) Cockerell, University of Colorado Studies, vol. 4, 1907, pp. 250-253.
- (2) Cockerell, Bull. Amer. Mus. Nat. Hist., vol. 22, 1906, pp. 446-447.
- (3) Cockerell, Ann. and Mag. Nat. Hist., Aug. 1907, p. 123. (Bright green males.)
- (4) Robertson, Trans. Amer. Ent. Soc., vol. 29, 1903, pp. 165-166, 170-171. (Species of Illinois.)
- (5) Cockerell, Proc. Acad. Nat. Sci. Phila., 1897, pp. 346-347. (Females resembling *O. densa*.)
- (6) Cockerell, Bull. Sci. Lab. Denison Univ., vol. 11, 1898, p. 63. (Species of New Mexico.)
- (7) Cockerell, Canadian Entomologist, April, 1909, p. 131. (Males with small joints of middle tarsi thickened.)
- (8) Cockerell, Entomological News, June, 1910, p. 273. (Females of medium size, of a deep blue or purplish color, with the hair either all black or black with a slight admixture, easily overlooked, of light.)

LIST OF SPECIES.

[The asterisk (*) indicates that the species is in the collection of the United States National Museum. Certain few specimens sent to the Museum by Professor Cockerell and labeled "cotypes" are considered paratypes, as Professor Cockerell uses the name "cotype" in the sense which the Museum uses "paratype." A good many of the species in the collection are homotypes made by Titus, or were determined by Professor Cockerell. The Museum has a goodly lot of unworked material in this genus, and when this has been determined the number of species in its collection will be greatly increased. Of the 167 names in the following list, 60 are represented by specimens in the collection. Of these 60, 22 are types or paratypes.—S. A. ROHWER.]

In each case the type-locality and collector of the type is given, if known. There are also references to the tables, numbered as in the list above.

**abjecta* CRESSON, 1878. Colorado (Ridings). Tab. 2.

A black species.

**abnormis* CRESSON, 1878. Colorado (Ridings, Morrison).

Male with peculiar legs, figured by Cresson. Trans. Amer. Ent. Soc., vol. 7, p. 105.

albiventris CRESSON, 1864. "Conn., New York, Penn." Tab. 4.

Ventral scopa white.

albolateralis COCKERELL, 1906. Florissant, Colorado (Cockerell). Tab. 2.

Possibly the female of *O. cyaneonitens*.

amala COCKERELL, 1907. Florissant, Colorado, June (Rohwer). Tab. 7.

Additional characters; Canadian Entomologist, 1910. p. 312.

**aprilina* COCKERELL, 1907. Boulder, Colorado, April (W. and T. Cockerell). Tab. 1.

Visita Pulsatilla. Mr. S. A. Rohwer took it at Boulder, May 15, 1908, at flowers of *Besseya plantaginea*.

Paratype.—Cat. No. 11919, U.S.N.M.

**armaticeps* CRESSON, 1878. Colorado (Ridings, Morrison). Tab. 1, 2.

armaticeps sapellonis COCKERELL, 1901. Hill above Beulah, New Mexico (Cockerell).

Female with cheeks very strongly and quite closely punctured; mesothorax strongly and densely punctured. Length, 12 mm.

**ashmeadii* TITUS, 1904. Dalles, Oregon.

Allied to *O. odontogaster*, but the male is larger, deeper colored, and has the antennæ with the scape black, the flagellum pale testaceous, excepting a black tip to the flattened last joint.

Type.—Cat. No. 6359, U.S.N.M.

**atriventris* CRESSON, 1864. Connecticut (E. Norton). Tab. 4.

West to Boulder, Colorado (S. A. Rohwer). Allied to *O. coloradella*, but clearly distinct.

atrocyanea COCKERELL, 1897. Olympia, Washington State, July (Kincaid). Tab. 5, 8.

Female with hair of pleura, sides of metathorax, and scutellum black, that on scutellum with a few pale hairs intermixed; head strongly blue.

Also in Ormsby County, Nevada (Baker).

arteca CRESSON, 1878. Mexico (Sumichrast).

Black; ventral scopa yellow.

basilissa COCKERELL, 1911. Claremont, California (Baker).

Magnificent deep purple; pubescence all black.

bella CRESSON, 1878. Colorado (Morrison). Tab. 3.

Bright green.

bennettæ COCKERELL, 1907. Boulder, Colorado, May (Mrs. C. Bennett). Tab. 3.

Brilliant green. Also in California.

besseyæ COCKERELL, 1910. Boulder, Colorado (S. A. Rohwer).

bottena COCKERELL, 1909. Lee County, Texas, April (Birkmann).

Ventral scopa yellowish-white. Allied to *O. subfasciata*.

- brevihirta* COCKERELL, 1907. Boulder, Colorado, June (W. P. Cockerell). Tab. 1.
Possibly the female of *O. cyaneonitens*.
- * *brevis* CRESSON, 1864. Rocky Mountains, Colorado. Tab. 4.
Supposed male; Proc. Acad. Nat. Sci. Phila., 1897, p. 345. In Tab. 4 the male would run to *pumila*, but is much larger, like *enena*, but cheeks with some black hairs.
- * *bruneri* COCKERELL, 1897. Colorado Springs, Colorado (L. Bruner). Tab. 1.
Brilliant blue-green.
Male; Ann. and Mag. Nat. Hist., Oct., 1908, p. 330. The male has much coarse black hair on the clypeus, etc.
A new locality is Durango, Colorado, May 27, 1899 (Osler).
Type.—Cat. No. 5806, U.S.N.M.
- bucconis* SAY, 1837. Indiana.
Same as *Ashmeadiella bucconis*.
- * *bucephala* CRESSON, 1864. Great Slave Lake, British America. Tab. 4.
- * *californica* CRESSON, 1864. Fort Crook, California (H. Ulke).
Female "shaped like *O. lignaria*, but is at once distinguished from that species by the black pubescence and the shape of the clypeus." The clypeus is rather deeply emarginate.
- * *calla* COCKERELL, 1897. Olympia, Washington (Kincaid).
Bright green; pubescence of male nowhere mixed with black.
Paratype.—Cat. No. 6866, U.S.N.M.
- * *canadensis* CRESSON, 1864. Canada West (Wm. Saunders). Tab. 4.
- cara* COCKERELL, 1910. Claremont, California (Baker). Tab. 8.
- casta* COCKERELL, 1910. Claremont, California (Baker). Tab. 8.
- * *cerasi* COCKERELL, 1897. Mesilla, New Mexico (Jessie E. Casad). Tab. 6.
Female with hair of thorax above bright rust-red; tegulae and ventral scopa black.
Paratype.—Cat. No. 3708, U.S.N.M. This specimen was determined by Cockerell but not designated as a type by him. Titus considers it as a paratype.
- * *chalybea* SMITH, 1854. St. John's Bluff, East Florida.
Steel blue; margin of female clypeus lobed in middle, the apex of the lobe emarginate, margin on each side of lobe crenulated.
Occurs in Texas; see Univ. of Colorado Studies, vol. 5 (1907), p. 37.
- * *chlorops* COCKERELL and TITUS, 1902. Trout Spring, New Mexico (Cockerell). Tab. 2.
Allied to *O. canadensis*.
New description: Bull. Amer. Mus. Nat. Hist., 1906, p. 448.
Type.—Cat. No. 14480, U.S.N.M.
- clarescens* COCKERELL, 1911. Claremont, California (Baker).
Female with ventral scopa black; hair of pleura and metathorax white; legs metallic.
- * *cobaltina* CRESSON, 1878. "Nevada, California (H. Edwards, Behrens)." Tab. 4.
Brilliant deep blue or purple.
Baker has taken it at Claremont, California.
- * *cognata* CRESSON, 1864. Illinois (E. Norton).
- collinsiae* ROBERTSON, 1905. Illinois (Robertson).
This is the insect earlier described by Robertson as the male of *O. major*.
- * *coloradella* COCKERELL, 1906. Boulder, Colorado, June 4 (W. P. Cockerell). Tab. 1.
Allied to *C. atriventris*.
Recent studies indicate that this is apparently a variety of *O. hesperella*.
- coloradensis* CRESSON, 1878. Colorado (Ridings, Morrison).
"Ventral scopa white or yellow." Apical margin of female clypeus coarsely crenulated. Also found in Ormsby County, Nevada (Baker), and at Peachland, British Columbia, Aug. 2 and 6, 1909 (J. B. Wallis). It is doubtful whether *O. hypochrysea rohveri* can be separated from this; specimens from Flagstaff, Arizona, are intermediate.

conjuncta CRESSON, 1864. Connecticut (E. Norton).

Punctures of female abdomen much stronger and less dense than in *O. albiventris*.
Ventral scopa white.

conjunctoides ROBERTSON, 1893. Citrus County, Florida (Robertson).

Male resembles *conjuncta*, having the same two tubercles, one above the other, on front; but lateral teeth of sixth segment broad and obtuse and produced downwards (acute in *conjuncta*).

copelandica COCKERELL, 1908. Copeland Park, Colorado (Rohwer).

Small black species with white scopa; abdomen slightly metallic. It is not unlike *O. abjecta*, but smaller, and easily separated by the scopa, which in *abjecta* is reddish-black. There is a superficial resemblance to *O. insularis* Schmkn. from Mallorca.

cordata ROBERTSON, 1902. Illinois (Robertson). Tab. 4.

"May be the male of *O. brevis*" (Robertson), but later Robertson found the female, which proves it to be quite distinct, the ventral scopa being yellowish. The male has the first ventral segment of abdomen emarginate.

cressonii DALLA TORRE, 1896.

Same as *conjuncta*; the name was proposed by Dalla Torre for *quadridentata* Cresson, not of Duméril, 1860. Duméril's insect was described under *Phyllotoma*, and appears to be of doubtful identity.

* **cyarella** COCKERELL, 1897. Olympia, Washington State, May (Kincaid).

Female about 9 mm. long, very broad, with large subquadrate head.

Type.—Cat. No. 6364, U.S.N.M.

* **cyaneonitens** COCKERELL, 1906. Florissant, Colorado (Rohwer). Tab. 1, 2.

A new locality is Durango, Colorado, June 7, 1898 (Osler).

* **davidsoniella** COCKERELL, 1905. Los Angeles, California (Davidson).

Male steel-blue, a little over 8 mm. long; antennæ black.

Type.—14479, U.S.N.M.

* **densa** CRESSON, 1864. Pikes Peak, Colorado. Tab. 1, 5.

The color of the female abdomen resembles that of *hendersoni*; but hair of pleura is white (black in *hendersoni*).

Additional details: Univ. of Colorado Studies, vol. 5 (1907), p. 38.

* **distincta** CRESSON, 1864. Connecticut (E. Norton).

Ventral scopa white; female broader and more robust than *albiventris* or *conjuncta*.

* **dubia** CRESSON, 1864. Pikes Peak, Colorado.

Resembles *O. atriventris*. Ventral scopa black.

The fossil "*Osmia*" *dubia* Germar 1849, was described as *Apiaria dubia*, and the reference to *Osmia* by Giebel (1856) is probably erroneous. Hence I think Cresson's name for our species may remain.

ednae COCKERELL, 1907. Boulder, Colorado, May (Edna Baker). Tab. 3.

enana COCKERELL, 1907. Florissant, Colorado, June 23 (Rohwer).

Male resembles *O. mertensiae*, but antennæ longer, legs not metallic, abdomen narrower and less shining, etc.

eutrichosa COCKERELL, 1910. Steamboat Springs, Colorado (Cockerell).

Male with no black hair anywhere.

exigua CRESSON, 1878. California (Henry Edwards).

Very small. "This is our smallest species" (Cresson, 1878).

Titus refers this to *Nothosmia*, and states that *Heriades glaucum* Fowler is a synonym.

* **faceta** CRESSON, 1878. "Can., N. Y., Ga." Tab. 5.

Allied to *O. chalybea*.

Additional details; Proc. Acad. Nat. Sci. Phila., 1897, p. 346.

Ventral scopa black, but white hair on lateral margins of abdomen. Fedor, Texas (Birkmann).

Kerrville, Texas, at flowers of *Marrubium vulgare*, Apr. 12, 1907 (F. C. Pratt).

felti COCKERELL, 1911. Karner, New York (E. P. Felt).

Allied to *O. densa*.

florissanticola COCKERELL, 1906. Florissant, Colorado (Cockerell). Tab. 2.

foxi CAMERON, 1901. "Sta. Fe Mts, New Mexico," but really Mexican.

Male 8 mm., said to be allied to *texana* and *subfasciata*; legs largely metallic.

frigida SMITH, 1854. Hudson Bay.

A black species, the female with a very large head; ventral scopa black.

Notes on type: Trans. Amer. Ent. Society, vol. 31, p. 332.

* *fulgida* CRESSON, 1864. Rocky Mountains, Colorado. Tab. 1.

A bright green species.

Male; Ann. and Mag. Nat. Hist., Nov., 1907, p. 445.

New localities are Ouray, Colorado (H. F. Wickham), Denver, Colorado (Osler), and South Park, Colorado (Osler.)

gabrielis COCKERELL, 1910. San Gabriel Mountains, California, 3,000 feet. (Grinnell). Tab. 8.

gaillardiae COCKERELL, 1906. Boulder, Colorado (W. P. Cockerell). Tab. 1.

Visits *Gaillardia* in July. Ventral scopa black.

* *gaudiosa* COCKERELL, 1907. Boulder, Colorado, April (Edna Baker). Tab. 3

Brilliant golden green. Also at Florissant; see Ann. and Mag. Nat. Hist., Oct., 1908, p. 330. The male type had the vertex, front, and thorax above with a strong suffusion of coppery-red or almost crimson; after four years, although the specimen was kept in the dark, this has faded to golden.

georgica CRESSON, 1878. Georgia (Morrison). Tab. 4.

Female with clypeus carinate and mandibles tuberculate; ventral scopa yellowish.

gillarum COCKERELL, 1906. Florissant, Colorado (Rohwer). Tab. 2.

* *globosa* CRESSON, 1864. Great Slave Lake, British America.

A small robust black species.

globosiformis COCKERELL, 1910. Steamboat Springs, Colorado (Cockerell).

Male entirely black with white pubescence.

* *grandior* COCKERELL, 1897. Olympia, Washington State, May (Kincaid).

Resembles *O. pascoensis*; clypeus dull and roughened (in *pascoensis* shiny, with well-separated punctures).

Paratype.—Cat. No. 6869, U.S.N.M.

granulosa COCKERELL, 1911. Mountains near Claremont, California (Baker).

grindelis COCKERELL, 1910. Eldora, Colorado (T. and W. Cockerell).

grinnelli COCKERELL, 1910. Strawberry Valley, San Jacinto Mountains, California (Grinnell).

hendersoni COCKERELL, 1907. Arapahoe Peak, Colorado (Rohwer). Tab. 1.

A high alpine species.

hesperella COCKERELL, 1906. Boulder, Colorado (W. P. Cockerell). Tab. 1.

Ventral scopa yellowish-white. Allied to *O. albiventris*.

I have taken it at flowers of *Cirsium*, June 28.

hudsonica CRESSON, 1864. Hudson Bay Territory.

A black species.

hypochrysea COCKERELL, 1906. Florissant, Colorado (Rohwer). Tab. 2.

Ventral scopa pale orange; anterior margin of clypeus (female) with a median tridentate elevation.

Also at Claremont, California, where it is variable (Baker).

* *hypochrysea rohweri* COCKERELL, 1907. Boulder, Colorado (Rohwer). Tab. 1.

Larger, with the mesothorax more sparsely punctured.

Also at Flagstaff, Arizona, at flowers of *Jris*, June 11, 1909 (F. C. Pratt).

Very close to *O. coloradensis* (which also occurs at Boulder, collected by W. P. Cockerell), but the mesothorax is shining steel blue (blue-black and dull in *coloradensis*), and sparsely punctured about the middle.

- The two species are very doubtfully distinct.

hypocrita COCKERELL, 1906. Boulder, Colorado (W. P. Cockerell). Tab. 1.

Looks like *Monumetha*. The male, discovered by Osler at Durango, Colorado, shows that this species must be referred to *Acidamea*.

hypoleuca COCKERELL, 1907. Boulder, Colorado, June (W. P. Cockerell). Tab. 1.

Perhaps a subspecies of *O. pentstemonis*, which occurs at higher altitudes.

illinoensis ROBERTSON=Male of *cobaltina*, according to Robertson; see Ent. News, 1902, p. 79.

In spite of Robertson's decision, I can hardly believe this is *cobaltina*, which is a species of the Pacific coast region.

Male entirely bright green, 8 mm. long; pubescence "white below, especially on clypeus, where it is also dense, above slightly tinged with ochraceous; on abdomen short and appearing subfuscous."

inermis ZETTERSTEDT, 1838. A species of northern and central Europe, said by Friese (1908) to occur in Labrador. Female 9½, male 8 to 9 mm.; black; thorax and first abdominal segment of female with fulvous hair above.

inspergens LOVELL and COCKERELL, 1907. Maine (Lovell).

Ventral scopa silvery-white, black at apex; lower part of female clypeus covered with very dark brown pubescence. Also in Massachusetts.

integra CRESSON, 1878. Colorado (Morrison).

Male steel-blue. Also in New Mexico.

At Claremont, California, Baker has taken a variety of the male with the hair of cheeks (except above) and of anterior legs black.

intrella COCKERELL, 1907. Boulder, Colorado, May (Edna Baker). Tab. 7.

Possibly a variety of *O. universitatis*.

**inurbana* CRESSON, 1878. Colorado (Ridings, Morrison).

Dark brassy green (male).

Additional details: Proc. Acad. Nat. Sci. Phila., 1897, p. 338. A variety (or closely allied species?) from New Mexico is described in Psyche, Dec., 1901, p. 283.

iridis COCKERELL and TITUS. Trout Spring, New Mexico (Cockerell).

Male with first ventral segment of abdomen emarginate; sixth dorsal entire.

New description: Ent. News, Dec., 1903, p. 233.

jurta CRESSON, 1864. Rocky Mountains, Colorado.

Allied to *O. longula*.

**kincaidii* COCKERELL, 1897. Olympia, Washington State (Kincaid).

Brilliant peacock-green.

Paratype.—Cat. No. 6867, U.S.N.M.

**latitarsis* CRESSON, 1864. "New York, Virginia."

Same as *bucephala*.

leonis COCKERELL, 1907. Boulder, Colorado, May (Edna Baker).

**lignaria* SAY, 1837. Tab. 4, 6.

Extends southwest to New Mexico.

lignaria lignariella COCKERELL, 1906. Romeroville, New Mexico (W. Porter).

Female 9½ mm. long; pale hair on abdomen practically confined to first segment.

Perhaps a distinct species.

lignicola PROVANCHER, 1882. Cap Rouge.

Same as *bucephala*.

lignivora PACKARD, 1867. "From cells in maple."

Female about 13 mm. long; hair of face below antennæ dark chocolate; ventral scopa largely reddish. See Univ. of Colorado Studies, vol. 5 (1907), p. 37.

**longula* CRESSON, 1864. Rocky Mountains, Colorado.

Resembles *O. florissanticola*. Mr. S. A. Johnson took it at Sapinero, Colorado, July 20, 1908.

**louisianæ* COCKERELL, 1910. Mound, Louisiana (C. R. Jones). Subgenus *Gnathosmia*.

Type.—Cat. No. 13545, U.S.N.M.

major ROBERTSON, 1902. Illinois (Robertson). Tab. 4.

Near to *atriventris*, but larger; female 11, male 10 mm.

malina COCKERELL, 1909. Near Boulder or Loveland, Colorado (C. De Voss).

Superficially like *O. wilmatte*, but thorax above with much more black hair, ocelli larger, face with tufts of white hair.

* **mandibularis** CRESSON, 1878. Colorado (Morrison).

Female with nodose process on mandibles.

marginipennis CRESSON, 1878. Colorado (Morrison).

"May be the male either of *longula* or *juxta*" (Cresson).

maura CRESSON, 1878. California (Henry Edwards).

Entirely deep black, with black hair.

megacephala CRESSON, 1864. Rocky Mountains, Colorado.

Resembles *O. bucephala*.

melanotricha LOVELL and COCKERELL, 1907. Maine (Lovell). Tab. 1.

Resembles *O. atriventris*. Also in Colorado.

mertensiae COCKERELL, 1907. Florissant, Colorado, June (Rohwer).

Visits *Mertensia*.

metitla COCKERELL, 1909. Boulder, Colorado, April 17 (G. M. Hite). Tab. 7.

Visits *Ribes pumilum*.

* **montana** CRESSON, 1864. Pike's Peak, Colorado.

Male with wings purely hyaline.

* **nanula** COCKERELL, 1897. Seattle, Washington, April and May (Kincaid).

* **nassa** COCKERELL, 1910. Claremont, California (Baker). Tab. 8.

Paratype.—Cat. No. 13439, U.S.N.M.

* **nifoata** COCKERELL, 1909. Troublesome, Colorado, June (Rohwer).

Abdomen of male with a ventral tooth. Allied to *O. odontogaster* and *O. ashmeadii*, the three forming the subgenus *Acanthosmioides*.

Paratype.—Cat. No. 14432 U.S.N.M.

* **nigrifrons** CRESSON, 1878. Colorado (Morrison). Tab. 1. 5.

Hair of pleura black, of scutellum light, with at most a few dark hairs intermixed.

Extends to Washington.

A new locality is Durango, Colorado, May 26, 1899 (Osler).

nigrifrons subaustialis COCKERELL, 1900. Beulah, New Mexico (W. Porter).

Female 10 mm.; anterior margin of clypeus with a broad shallow emargination.

nigritula FRIESE, 1902.

Belongs to *Leucosmia*, according to Titus, who redescribes the male; Proc. Ent. Soc. Wash., vol. 7, 1906, p. 157 (as *parvula*).

* **novomexicana** COCKERELL, 1903. Arroyo Pecos, Las Vegas, New Mexico (W. P. Cockerell). Tab. 1.

Also in Colorado. Related to *O. grandior*.

Type.—Cat. No. 6362 U.S.N.M.

oblonga PROVANCHER, 1882. = *Monumetha albifrons*.

First described as a *Megachile*, and name preoccupied.

* **odontogaster** COCKERELL, 1897. Olympia, Washington (Kincaid).

Resembles *O. inurbana*; second ventral abdominal segment of male toothed.

Paratype.—Cat. No. 3709, U.S.N.M.

olivacea COCKERELL, 1907. Boulder, Colorado, April (W. P. Cockerell). Tab. 1.

Female; Ann. and Mag. Nat. Hist., Aug., 1907, p. 127.

Male with hind basitarsus toothed.

A variety of the male (variety *a*) with the thorax above without black hairs, was taken by Mr. S. A. Rohwer at Boulder, April 14, 1907, at flowers of *Ribes pumilum*.

parva PROVANCHER, 1882. Canada.

Same as *nigritula*.

parvula DALLA TORRE, 1896. (Name preoccupied.)

Same as *nigritula*.

pasadenæ COCKERELL, 1910. Pasadena, California (Grinnell).

**pascoensis* COCKERELL, 1897. Pasco, Washington, May (Kincaid). Tab. 1.

Female about 15 mm.; hair of head entirely black, except a yellowish-white fringe on occipital margin.

Paratype.—Cat. No. 6868, U.S.N.M. Not labeled as a paratype by Cockerell, but determined by him.

pentstemonis COCKERELL, 1906. Florissant, Colorado (Rohwer). Tab. 1. 2.

Visits *Pentstemon*.

permorata COCKERELL, 1910. Steamboat Springs, Colorado (Cockerell).

Also in New Mexico. Female about 14 mm. long, hair of head and thorax above very bright fox red.

phacellæ COCKERELL, 1907. Ward, Colorado, July (W. and T. Cockerell). Tab. 1.

phenax COCKERELL, 1897. Mesilla, New Mexico, April (Jessie E. Casad). Tab. 6.

Ventral scopa pale fulvo-ochreous; tegulæ shining rufotestaceous.

physariæ COCKERELL, 1907. Florissant, Colorado, June 1 (Rohwer).

Male with sixth dorsal segment entire; flagellum very strongly crenulate beneath.

pikæ COCKERELL, 1907. Halfway House, Pike's Peak, Colorado (Cockerell). Tab. 1.

Visits *Salix* at end of May.

platyura COCKERELL, 1911. Mountains near Claremont, California (Baker).

pogonigera COCKERELL, 1910. Strawberry Valley, San Jacinto Mountains, California (Grinnell).

**propinqua* CRESSON, 1864. Fort Crook, California (H. Ulke). Tab. 1.

Allied to *O. lignaria*. Specimens from Claremont, California, are in the Baker collection.

**proxima* CRESSON, 1864. "Maine and Fort Good Hope, Mackenzie River." Tab. 1. Same as *atriventris*.

**prunorum* COCKERELL, 1897. Mesilla Park, New Mexico, April (Cockerell). Tab. 6.

Ventral scopa black in middle and yellowish-white at sides.

Paratype.—Cat. No. 4344, U.S.N.M.

pseudamala COCKERELL, 1910. Steamboat Springs, Colorado (Cockerell).

pulsatillæ COCKERELL, 1907. Boulder, Colorado, April (W. P. Cockerell). Tab. 1.

Visits *Pulsatilla*.

pumila CRESSON, 1864. Pennsylvania. Tab. 4.

purpurascens SMITH, 1849. Mistakenly supposed to be British.

Same as *lignaria*.

purpurea CRESSON, 1864. "Conn., Penn., N. Jersey."

Distinguished (female) by the dark purple color and narrow whitish hair-bands of abdomen; ventral scopa black.

**pusilla* CRESSON, 1864. Pike's Peak, Colorado.

Also in New Mexico.

putata COCKERELL, 1910. Mountains near Claremont, California (Baker). Tab. 8.

quadriceps CRESSON, 1878. California (Henry Edwards). Tab. 8.

Resembles *O. armaticeps*, but head (female) not armed beneath, and the pubescence is entirely black.

quadridentata CRESSON, 1878. New York (Comstock). Tab. 4.

Male abdomen quadridentate, the two outer teeth being on sixth segment; front in both sexes with two tubercles, one above the other; ventral scopa white. This is considered to be the male of *conjuncta*.

**ramaleyi* COCKERELL, 1907. Boulder, Colorado, May (Edna Baker).

Ventral scopa orange. Appears to be a variety of *O. hesperella*.

regulina COCKERELL, 1911. Claremont, California (Baker).

remotula COCKERELL, 1911. Claremont, California (Baker). Subgenus *Erythrosmia*.
 * *ribifloris* COCKERELL, 1900. Romeroville, New Mexico, April 29 (W. Porter).
 Tab. 8.

Female 11 mm., dark shining blue, pubescence all black, legs blue.

Allied to *O. cobaltina*, but much darker. Specimens in the Baker collection were obtained by Oslar at Santa Fe, New Mexico, and Thumb Butte, Phoenix, Prescott, and Copper Basin, in Arizona. A species from Arizona, named by Titus in manuscript after Biedermann, differs in being green, but is probably only a race. It has a broader abdomen than normal *ribifloris*.

Paratype.—Cat. no. 14473 U.S.N.M.

* *rustica* CRESSON, 1864. Easton, Pennsylvania (E. Norton).

Said to be a variety of *O. albiventris*; the male has the hair of thorax above bright rust-red.

saccharosa COCKERELL, 1910. Santa Rosa Mountains, California, 7,500 feet (Grinnell).

seneciophila COCKERELL, 1907. Florissant, Colorado (Rohwer).

Also in New Mexico, at 11,000 feet. Third ventral abdominal segment of male with a semicircle of long pale orange hairs in the median emargination.

senior COCKERELL, 1907. Boulder, Colorado, June 12 (W. P. Cockerell). Tab. 1.

* *sericea* CRESSON, 1864. Rocky Mountains, Colorado.

"Somewhat resembles *O. purpurea* (male), but the punctuation of the abdomen is finer, and the segments have no appearance of an apical whitish fringe" (Cresson). Abdomen black, faintly tinged with blue and purple.

* *simillima* SMITH, 1854. "Nova Scotia; United States (Lieut. Redman)."

Closely resembles *O. cærulescens* of Europe and Asia.

See Trans. Amer. Ent. Society, 1905, p. 332, for notes on supposed type, which, however, does not accord well with Smith's description.

spoliata PROVANCHER, 1888.

Same as *Andronicus cylindricus*.

stasima LOVELL, 1909. Rockport, Massachusetts.

Female in Tab. 4 runs to *O. major*; it is very like *simillima*, but differs by the broader face and absence of black hair on vertex and clypeus. Middle tooth of mandibles is much nearer to the outer than the inner tooth, as in *O. major*.

* *subfasciata* CRESSON, 1872. Texas (Belfrage).

"Ventral scopa pale ochraceous;" but white in supposed type. See Univ. of Colorado Studies, Dec. 1907, p. 37.

Birkmann has taken it in Lee County, Texas, at flowers of *Phacelia*.

Six females from Terrell, Texas (F. C. Bishopp), are peculiar for their olive-green color, and seem to represent a local race.

Paratype.—Cat. No. 1770, U.S.N.M.

* *subornata* COCKERELL, 1897. Olympia, Washington, June (Kincaid).

Female 14 mm. long, pure black; hair of thoracic dorsum black on disk with a pale band before and behind.

Paratype.—Cat. No. 6879, U.S.N.M.

* *subpurpurea* COCKERELL, 1897. Olympia, Washington, May (Kincaid).

Female about 14 mm. long, dark steel blue; hind margins of abdominal segments 2 to 5 each, with a thin and narrow, but evident, white hair-band.

Paratype.—Cat. No. 6873, U.S.N.M.

subtrevoris COCKERELL, 1906. Near Lake George, Colorado (Rohwer). Tab. 2.

tarsata PROVANCHER, 1888. Cap Rouge.

Belongs to *Centrosmia*, according to Titus, who redescribes the male; Proc. Ent. Soc. Wash., vol. 7, 1906, p. 158. It is 9 mm. long, blue-black, abdomen shining blue, tarsi of middle legs deformed much as in *bucephala*.

texana CRESSON, 1872. Texas (Belfrage).

Male dark green or blue-green, with pale pubescence; legs black.

- **titani* COCKERELL, 1905. Los Angeles, California (Davidson).
Also in New Mexico. See Ann. and Mag. Nat. Hist., May, 1907, p. 369.
Ventral scopa white. Also at Las Cruces, New Mexico (C. H. T. Townsend).
Type.—Cat. No. 14481, U.S.N.M.
- **trevoris* COCKERELL, 1897. Seattle, Washington, May (Kincaid).
Female 8 mm.; hair of face long, all black, of thoracic dorsum orange-fulvous.
- **tristella* COCKERELL, 1897. Olympia, Washington (Kincaid).
Pubescence of face, vertex, thoracic dorsum, and ventral scopa wholly black.
Type.—Cat. No. 6863, U.S.N.M.
- **universitatis* COCKERELL, 1907. Boulder, Colorado, April (Edna Baker). Tab. 7.
- **vallicola* COCKERELL, 1907. Florissant, Colorado, June (Rohwer).
Visits *Ribes*. Superficially like *O. mertensiae*; male flagellum wholly dark; legs strongly metallic.
- **vicina* CRESSON, 1864. Virginia.
Same as *pumila*.
- **viridimicans* COCKERELL, 1897. Olympia, Washington (Kincaid).
Female brilliant peacock-green, with the pubescence entirely black; abdomen somewhat elongate and nearly parallel sided.
- **viridior* COCKERELL, 1907. Boulder, Colorado, May (Rohwer). Tab. 1.
Allied to *O. marginipennis*.
Also from Chimney Gulch, Colorado, May 9, 1899 (Osler).
- **viridis* CRESSON, 1864. Rocky Mountains, Colorado.
Same as *fulgida*, or possibly a distinct but very closely-related form.
- **wardiana* COCKERELL, 1907. Ward, Colorado, 9,200 feet (W. and T. Cockerell). Tab. 1.
Also at Georgetown, Colorado, in the Baker collection.
- **watsoni* COCKERELL, 1911. Albuquerque, New Mexico (J. R. Watson).
Male antennae with last joint flattened, more or less discoid, shining black.
- **wheeleri* COCKERELL, 1906. Florissant, Colorado (Rohwer). Tab. 1, 2.
The male has the hind basitarsus toothed.
- **wilmattae* COCKERELL, 1906. Boulder, Colorado (W. P. Cockerell). Tab. 1, 2.
Allied to *O. brevis*. Typical *wilmattae* has a good deal of black hair mixed with the white on scutellum. The two following are regarded as varieties of *wilmattae* (female), but are possibly distinct:
- Variety *a*. Hair of scutellum white; mesothorax shining green; face rather narrower; hair of face and vertex coarse and black, a little white on occiput; hind margins of abdominal segments shining olive-green. Florissant, Colorado, June 21 (S. A. Rohwer).
- Variety *b*. Hair of scutellum at least nearly all white; mesothorax dull blue-black; hair of face and vertex coarse and black, a little white on occiput; hind margins of abdominal segments dark purple. Copeland Park, Boulder County, Colorado, Sept. 1907 (Hite).
- The following species are only known in the male sex: *Osmia abnormis*, *amala*, *aprilina*, *chlorops*, *collinsiae*, *conjunctoides*, *cyaneonitens*, *davidsoniella*, *enena*, *eutrichosa*, *exigua*, *foxi*, *integra*, *integrella*, *inuybana*, *iridis*, *marginipennis*, *mertensiae*, *metitia*, *montana*, *nigritula*, *pasadenae*, *physariae*, *pseudamala*, *pulsatillae*, *pusilla*, *rustica*, *seneciophila*, *sericea*, *tarsata*, *texana*, *universitatis*, *vallicola*, *viridior*, *watsoni*, and *wheeleri*.
- The following, with black ventral scopa, are only known in the female sex: *armaticeps*, *atrocyanea*, *brevihirta*, *californica*, *cara*, *casta*, *cerasi*, *cyanella*, *florissanticola*, *gabrielis*, *gaillardiae*, *giliarum*, *grandior*, *grindeliae*, *grinnelli*, *hendersoni*, *hypoleuca*, *juxta*, *leonis*, *lignariella*, *longula*, *malina*, *megacephala*, *nassa*, *nigrifrons*, *nigrifrons subaustralis*, *novomexicana*, *pascoensis*, *permorata*, *piketi*, *pogonigera*, *putata*, *quadriceps*, *sanctae-roxae*, *senior*, *stasima*, *subtrevoris*, *trevoris*, *tristella*, *wardiana*, and *wilmattae*.

NEW ARENACEOUS FORAMINIFERA FROM THE PHILIPPINE ISLANDS AND CONTIGUOUS WATERS.

By JOSEPH A. CUSHMAN,
Of the Boston Society of Natural History.

The species of arenaceous foraminifera described here are from the dredgings of the U. S. Fisheries steamer *Albatross* about the Philippine Islands and in contiguous waters, the material from which has kindly been placed in my hands by the Bureau of Fisheries for the description of the foraminifera. All but one of these species belong to known genera but all are apparently undescribed. Some of them are from little-known genera and are for this reason very interesting, as they add greatly to the known distribution of the genera to which they belong. The plate gives figures of the various species.

DENDROPHYRA RAMOSA, new species.

Plate 28, figs. 7, 8.

Description.—Test large, laterally compressed, branching, wall with a chitinous base over which there is a thick layer of mud or fine sand and scattered sponge spicules; apertures at the ends of the branching portions elliptical.

Length 10 mm. or more.

Type-specimen.—Cat. No. 8463, U.S.N.M., from *Albatross* station D5385, Ragay Gulf, Luzon, 327 fathoms in gray mud, with a bottom temperature of 62.4° F. Other stations at which this species occurred are D5438, west coast of Luzon, 297 fathoms, green mud, 46.2° F. bottom temperature; D5460, east coast of Luzon, 565 fathoms, gray mud; D5470, 560 fathoms, mud; D5622, between Gillolo and Makyan Islands, Dutch East Indies, 275 fathoms, gray mud.

This species evidently belongs to the genus *Dendrophyra* as described, but is much larger than either of the other two described

species. The figured specimen is evidently only a fragment, as are all the specimens seen, and the complete test must be considerably larger. There is some variation in the color and texture of the wall and the comparative amount of spicules, depending somewhat upon the bottom conditions. All the stations are in fairly deep water compared with the shore conditions under which the other two known species were found. Usually specimens were very numerous, making up the large mass of the dredged material at the type station.

HALIPHYSEMA CATENULATA, new species.

Plate 28, figs. 5, 6.

Description.—Test elongate, tapering, with numerous constrictions as though segmented; wall arenaceous, with many included fragments of sponge spicules and with a crown of elongated spicules about the aperture; basal end with a sort of expanded portion like a proloculum, also made up largely of broken spicules; aperture terminal, circular, surrounded by the crown of erect spicules.

Length about 10 mm.

Type-specimen.—Cat. No. 8464, U.S.N.M., from *Albatross* station D5630, south of Patiente Strait, Dutch East Indies, 569 fathoms. The species was very common at this station, but was not met with elsewhere in the dredgings.

The spicules throughout the test except at the apertural tip are broken fragments, but about the aperture there are elongate spicules not entire but so placed that they rise up above the aperture like a crown.

MARSIPELLA GIGANTEA, new species.

Plate 28, figs. 1, 2.

Description.—Test elongate, tapering, nearly straight; wall of broken sponge spicules and arenaceous material, reddish-brown in color, spicules for the most part placed nearly in the axis of the test, occasionally projecting out from the wall; aperture circular, terminal, at the larger end.

Length up to 15 mm.

Type-specimen.—Cat. No. 8465, U.S.N.M., from *Albatross* station D5630, south of Patiente Strait, Dutch East Indies, 569 fathoms.

This species is much larger than any known species of this genus but has the usual characters for *Marsipella*.

AMMOSPHERULINA, new genus.

Test arenaceous, spherical, attached, with one or more interior chambers entirely inclosed, apertures interstitial.

Type-species.—*A. adhaerens*, new species.

AMMOSPHERULINA ADHÆRENS, new species.

Plate 28, figs. 11, 12.

Description.—Test spherical, adherent, wall arenaceous; composed of two or more chambers, each included by the one next formed, eccentric; color light yellowish-brown.

Diameter about 0.75 mm.

Type-specimen.—Cat. No. 8466, U.S.N.M., from *Albatross* station D5637, in the vicinity of Bouro Island, Dutch East Indies, 700 fathoms, gray mud.

This is a peculiar form somewhat like *Psammosphæra*, but having chambers entirely included by the one last formed. On account of its small size and attached character it may easily be overlooked. The figured specimen was attached to a specimen of *Saccorhiza ramosa*.

REOPHAX HORRIDA, new species.

Plate 28, figs. 3, 4.

Description.—Test elongate of several chambers, with a nearly straight axis, chambers gradually increasing in size; wall arenaceous with an abundance of included sponge spicules so arranged as to give a bristly appearance to the exterior of the test; aperture terminal, with a well developed neck.

Length about 3 mm.

Type-specimen.—Cat. No. 8467, U.S.N.M., from *Albatross* station D5582, vicinity of Darvel Bay, Borneo, 890 fathoms, bottom temperature 38.3° F.

This species differs from others described in the character of the wall, the great number of included spicules bristling in all directions giving a spiny appearance to the wall.

HORMOSINA MONILE, new species.

Plate 28, figs. 9, 10.

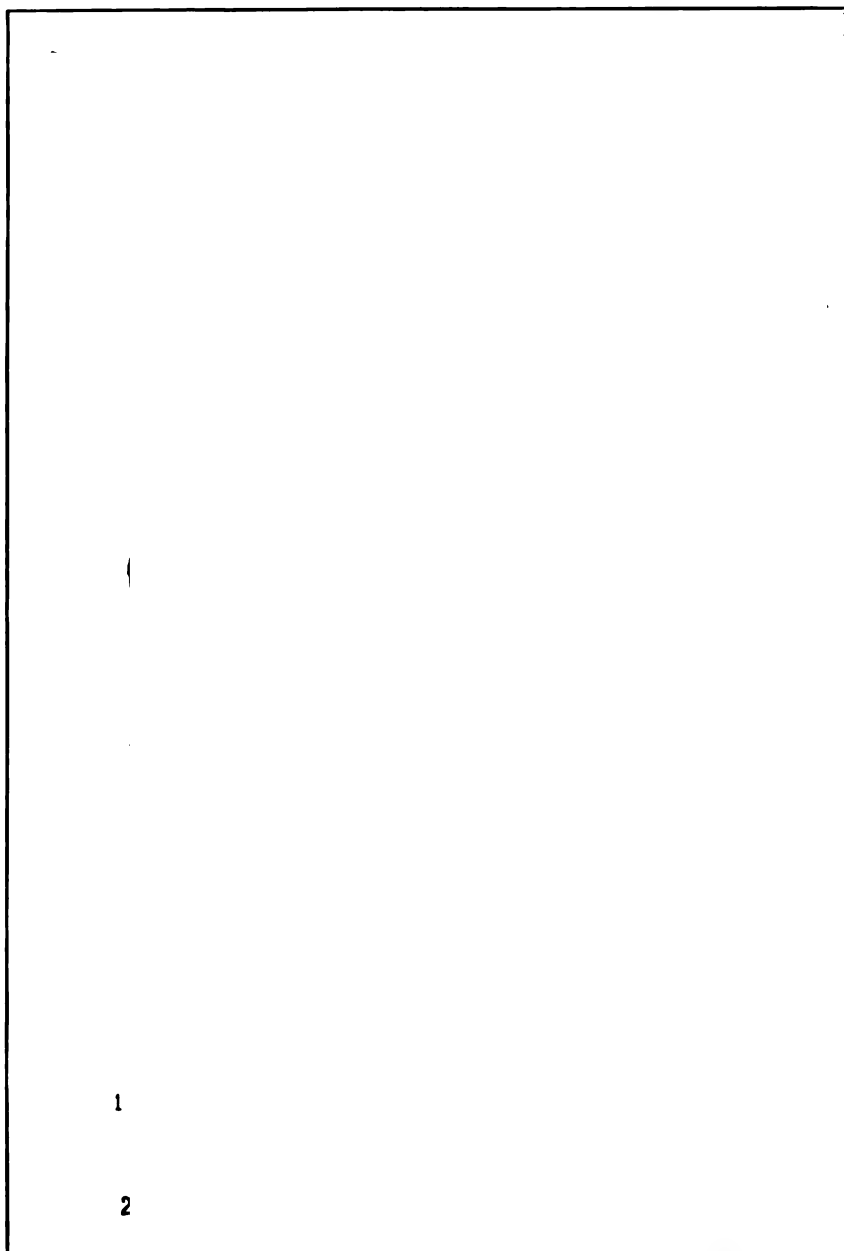
Description.—Test elongate, axis slightly but evenly curved; chambers several, six or more, increasing gradually in size toward the apertural end, oval, joined by broad connecting portions; wall arenaceous, rather hispid; aperture very small, at the end of a short, stout neck.

Length about 6 mm.

Type-specimen.—Cat. No. 8468, U.S.N.M., from *Albatross* station D5539, between Negros and Siquijor, depth not given. This differs in its characters from other described species, especially in the moniliform appearance, due to the peculiar way in which the chambers are joined.

EXPLANATION OF PLATE 28.

- Fig. 1. *Marsipella gigantea*, new species. Front view, $\times 15$.
2. *Marsipella gigantea*, new species. Apertural view, $\times 15$.
3. *Reophax horrida*, new species. Front view, $\times 30$.
4. *Reophax horrida*, new species. Apertural view, $\times 30$.
5. *Haliphysema catenulata*, new species. Front view, $\times 15$.
6. *Haliphysema catenulata*, new species. Apertural view, $\times 15$.
7. *Dendrophyra ramosa*, new species. Front view, $\times 15$.
8. *Dendrophyra ramosa*, new species. Apertural view, $\times 15$.
9. *Hormosina monile*, new species. Front view, $\times 15$.
10. *Hormosina monile*, new species. Apertural view, $\times 15$.
11. *Ammosphærulina adhaerens*, new species. Interior view, $\times 30$.
12. *Ammosphærulina adhaerens*, new species. Exterior view, $\times 30$.



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2

ARENACEOUS FORAMINIFERA.

FOR EXPLANATION OF PLATE SEE PAGE 230.

THE CHIMÆROID FISHES OF THE PHILIPPINE ISLANDS,
WITH DESCRIPTION OF A NEW SPECIES.

By HUGH M. SMITH,¹

*United States Deputy Commissioner of Fisheries and Director of the
Albatross Philippine Expedition.*

No chimæroid fishes have up to this time been recorded from the Philippine Islands. The *Albatross* collection contains six specimens of the genus *Chimæra* representing two species, together with a remarkable egg capsule of a *Rhinochimæra* from the coast of Celebes.

CHIMÆRA PHANTASMA Jordan and Snyder.

This species, described from Japan by Jordan and Snyder in 1900, is represented in the *Albatross* collection by five specimens, as follows:

(1) Female, 46.75 cm. long, taken with a beam trawl on July 24, 1908, at station 5296 (lat. 13° 40' 09'' N.; long. 120° 57' 45'' E.), in Verde Island Passage off Matocot Point, southern Luzon, at a depth of 210 fathoms; (2) female, 22 cm. long to end of base of second dorsal (plus 18 cm. for caudal fins and filament), taken with a beam trawl on July 24, 1908, at station 5297, in the same locality, at a depth of 198 fathoms; (3) male, 20.5 cm. long to end of base of second dorsal (plus 18 cm. for caudal fins and filament), taken with a beam trawl on August 9, 1909, at station 5516 (lat. 8° 46' N.; long. 123° 32' 30'' E.), off Point Tagolo Light, northern Mindanao, at a depth of 175 fathoms; (4) male, 18.5 cm. long to end of base of second dorsal (caudal filament missing), taken with a beam trawl on July 24, 1908, at station 5289 (lat. 13° 41' 50'' N.; long. 120° 58' 30'' E.), in Verde Island Passage off Matocot Point, southern Luzon, at a depth of 172 fathoms; (5) male, 11.5 cm. long to end of base of second dorsal (plus 11.2 cm. for caudal fins and filament), taken with a beam trawl on July 24, 1908, at station 5298 (lat. 13° 43' 25'' N.; long. 120° 57' 40'' E.), in Verde Island Passage off Matocot Point, southern Luzon, at a depth of 140 fathoms. The younger specimens differ from the older in having the longitudinal stripe more distinct, and the body and fins less pigmented.

¹ In the study of this collection the writer has had the assistance of Mr. Lewis Radcliffe, who assumes joint authority for the new species described.

CHIMÆRA DEANI Smith and Radcliffe, new species.

Plate 29.

Head short, contained 4.6 times in length from snout to beginning of supracaudal fin and 2.8 times in second dorsal base; depth of body slightly less than length of head; snout obtuse, upper and lower profiles similar; eye large, contained 2.3 times in head, placed high on side of head and inclined upward and outward, forehead somewhat prominent in front of eye; lateral line nearly straight throughout.

Dorsal spine slender, as long as head, with a few feeble serrations on distal half, dorsal rays one fourth longer than spine, the tips when depressed extending to opposite base of ventrals; notch separating two dorsals very narrow; second dorsal highest anteriorly, where the rays are 0.8 diameter of eye, 2 times length of posterior rays, and more than twice length of shortest rays in the indented middle section of the fin; supracaudal of same height as lowest part of second dorsal, its base about three-sevenths of length of head; subcaudal of same height as supracaudal, but extending further forward; caudal filament very long and delicate, its length greater than distance from tip of snout to beginning of supracaudal; anal fin lacking; ventrals pointed, the posterior border concave; pectorals large and reaching well beyond the ventral base, the outer angle pointed, the posterior margin slightly convex.

Color: Entire body and fins uniform blackish brown.

Type.—Cat. No. 72284, U.S.N.M., a female specimen 43 cm. long (19.5 cm. from tip of snout to supracaudal, 23.5 cm. from beginning of supracaudal to tip of filament), taken with a beam trawl on January 15, 1908, at station 5111 (lat. 13° 45' 15" N.; long. 120° 46' 30" E.), off Sombrero Island, west coast of Luzon, at a depth of 236 fathoms.

This species most closely resembles *C. mirabilis* Collett, but differs in having a smaller eye; higher first dorsal, with longer, more slender spine; higher second dorsal; less extensive subcaudal; longer pectorals, different coloration, etc.

Named for Prof. Bashford Dean, of Columbia University, in recognition of his able studies of the chimæras.

RHINOCHIMÆRA PACIFICA (Mitsukurina).

The collection contains an egg capsule of a *Rhinochimæra* brought up in a beam trawl at station 5656 (lat. 3° 17' 40" S.; long. 120° 36' 45" E.), in the Gulf of Boni, Celebes, from a depth of 484 fathoms. Other fishes taken at this station were *Calorhynchus*, *Neoscopelus*, a leptocephalid, a halieuteid, and several small eels. This capsule agrees perfectly with the one described as being produced by *R. pacifica*,¹ heretofore known only from Japan.

¹ Dean, Chimæroid Fishes and their Development, p. 33.

U. S. NATIONAL MUSEUM

PROCEEDINGS, VOL. 42 PL. 29

CHIMÆRA DEANI.

FOR DESCRIPTION SEE PAGE 232.

DESCRIPTIONS OF NEW SPECIES OF PARASITIC COPEPODS IN THE COLLECTIONS OF THE UNITED STATES NATIONAL MUSEUM.

By CHARLES BRANCH WILSON,
Of the Department of Biology, State Normal School, Westfield, Mass.

INTRODUCTORY.

The species described in the following paper were obtained from different sources, the first two from the American Museum of Natural History of New York City, and the last three from the United States National Museum. The two former were sent to the author for identification. After it had been determined that they represented new species of *Argulus* and *Achtheinus*, respectively, the American Museum very courteously allowed duplicates to be selected from them and deposited in the National Museum to serve as cotypes of the species. The other three species were all taken from the gills of a single fish, a *Polynemus tetradactylus*, from Batavia, Java, from the collection of the United States National Museum. These three belong to the genera *Caligus*, *Parapetalus*, and *Lernanthropus*, respectively. The first of these had been very imperfectly described and figured by Bassett-Smith, the second was wrongly referred by the same author to the genus *Caligus*, while the third is new to science. A brief record is here introduced of the finding, on the California coast, of another species, *Achtheinus dentatus*, which had previously been recorded only from South America.

In all, therefore, the present paper deals with six species, of which three are new.

DESCRIPTIONS OF NEW SPECIES.

ARGULUS INGENS, new species.

Plates 30 and 31, fig. 7.

Female.—Carapace elliptical, one-sixth longer than wide; antero-lateral sinuses sharply defined but not very deep; posterior sinus narrow, two-fifths the length of the carapace, with parallel sides; lobes not quite reaching the abdomen and narrowed posteriorly, but covering all of the swimming legs except the very tips.

Respiratory tracts of peculiar shape, as shown in figure 5, the smaller tract a perfect circle, 1 mm. in diameter, set into the inner side of the larger one; the latter made up of an anterior circular area the same size as the small area, a narrow neck around the latter, and an elongate posterior portion, abruptly widened into a triangle with rounded corners and with a triangular incision on its anterior margin just behind the small area.

Abdomen broadly ovate, one-half the length of the carapace, the base projecting forward as a broadly rounded lobe on either side of the last thorax segment, so as almost to meet the carapace lobes; anal sinus triangular, four-sevenths the length of the abdomen, with triangular and acuminate lobes; papillæ lateral, at the center of the sides of the sinus, linear and each tipped with three small setæ.

Sucking disks, each one-fourth the width of the carapace, situated far forward and so close together that their inner margins almost touch; supporting rays of the margin made up of a series of oblong rods placed end to end and diminishing regularly and rapidly in size outward (see fig. 6).

There are two small tactile papillæ just behind the opening of the oviduct, their convex sides touching on the midline, their anterior ends enlarged into circular pads.

Antennæ of medium size, the first pair with comparatively small claws on the basal joint, the three terminal joints very slender and scarcely reaching beyond the tip of the basal joint; second pair long and slender, armed with only a few minute spines on the two terminal joints, but with a large and sharp spine just behind the base of the proximal joint. Maxillipeds stout, the terminal joint small and tipped with three tiny claws, the third joint with a broad lamellar process on its ventral surface near the proximal end, the basal joint with a triangular plate, whose two outer teeth are close together and at some distance from the inner one, all the teeth of medium length and acuminate.

There are two pairs of accessory spines close to the midline opposite the bases of the maxillipeds. All four pairs of swimming legs are furnished with flagella, and the bases of the fourth legs are produced into boot-like tactile processes not quite reaching the lateral margins of the abdomen. The mouth-tube is long and narrow with the opening on the ventral surface and singularly square in outline.

Male.—General shape similar to that of the female, but the anterior margin of the cephalic area projects much more strongly, the lateral lobes of the carapace are much longer, overlapping the abdomen considerably and leaving a much narrower posterior sinus. The anterior corners of the abdomen are produced into narrow knobs or processes, extending forward and outward. In the accessory sexual organs the basal joints of the first legs are produced backward and

fringed with a dense row of long fine hairs; the proximal joint of the second legs has a lunate process on the ventral surface near the distal end, the two ends of the process curving over ventrally toward each other; the proximal joint of the third legs has a finger-like process at the distal anterior corner and a dense tuft of fine hairs opposite on the posterior margin; the fourth legs have the usual peg on the anterior distal margin of the basal joint, while the boot-like process is fringed with long and very fine hairs (see fig. 4).

The accessory sexual apparatus is thus more complicated than usual and is peculiar for the abundance of dense hair fringes.

Color (preserved material, both sexes) a uniform yellowish brown, marked with small spots of darker brown over most of the carapace and the center of the abdomen.

Total length of female, 21.5 to 25 mm.; of male, 16 mm. Carapace of female, 14.5 mm. long, 12.5 mm. wide. Abdomen, 7 mm. long, 5.5 mm. wide. Carapace of male, 12 mm. long, 9 mm. wide.

(*ingens*, of very large size.)

This species can be recognized by its great size, by the approximation of the two outer spines on the basal plate of the maxilliped, and by the complicated accessory sexual apparatus of the male, particularly by the dense hair fringes. This is by far the largest American species, and the only foreign species that surpasses it is *A. scutiformis* Thiele, the female of which is sometimes 30 mm. long.

Two females and a male of this species were obtained by the American Museum of Natural History, through Dr. L. Hussakof, from the mouth of the alligator gar, *Lepisosteus tristachys* (Bloch and Schneider), in Moon Lake, Mississippi. The male and one female are made the types of the species and are retained by the American Museum. The other female becomes a cotype in the National Museum with Cat. No. 42290, U.S.N.M.

ACHTHEINUS PINGUIS, new species.

Plate 31, figs. 8-14, and plate 32, figs. 15-21.

Female.—General form more like that of *Perissopus* than either of the species hitherto described. Carapace trapezoidal, widest across the posterior border, considerably narrowed anteriorly, with nearly straight sides.

Frontal plates thoroughly fused with the head, their anterior margin entire and evenly rounded, with a shallow sinus at the center.

Posterior margin of carapace with flattened curves, somewhat reentrant at the center; posterior sinuses shallow and narrow, posterior lobes short and blunt; lateral areas narrow, with the transverse grooves practically obliterated, appearing only as slight notches on the lateral margins. Dorsal plates covering the fused second and third thorax segments, of the same width as the carapace, elliptical, sepa-

rated to their very bases and not quite meeting on the midline. Dorsal plates on the fourth segment ovate, widened posteriorly so as just to meet, one-eighth wider than the first pair and projecting behind the latter only one-fifth of their length.

Genital segment one-fourth wider and longer than the carapace, with strongly convex sides and well-rounded posterior corners; posterior sinus wide and deep, with nearly parallel sides.

Abdomen one-jointed and triangular, much wider than long, with a narrow, slit-like posterior sinus; anal laminæ broad, strongly flattened, widely separated, and not reaching the posterior margin of the genital segment, each tipped with three minute spines.

At the base of the abdomen on either side is a small accessory lobe which doubtless represents the rudiments of the sixth segment.

The egg strings are relatively narrow, and give evidence of being quite long, though no unbroken ones have as yet been obtained; the eggs are exceptionally thin and very numerous.

Basal joint of the first antennæ swollen, considerably wider but shorter than the terminal joint, both joints sparsely armed with setæ.

Second antennæ stout, the terminal claw strongly curved; maxillæ in the form of flattened plates on either side of the base of the mouth tube. In the maxillipeds the pad on the basal joint is large and swollen, the terminal claw is long and stout and fits into a depression in the pad near its inner end (see fig. 16).

All four pairs of legs are small and rudimentary and destitute of plumose setæ, but they are distinctly biramose, the rami of the first three pairs two-jointed, with the joints about equal in size, of the fourth pair one-jointed, with minute spines on the exopod only.

Just outside of each exopod there is a small papilla tipped with a short and weak spine. The fifth legs are in the form of long and narrow papillæ projecting from the ventral surface of the posterior lobes, each tipped with a single short spine. Cement glands similar to those of *oblongus*, but relatively larger, and with the divisions more plainly visible (see fig. 21).

Total length, 5.75 mm. Carapace, 2.33 mm. long, 2.4 mm. wide. Both pairs of dorsal plates 1.2 mm. long, first pair each 1.2 mm. wide, second pair each 1.4 mm. wide. Genital segment, 3 mm. long, 3.1 mm. wide. Egg strings, 0.3 mm. wide and at least 8 mm. long.

Male.—A *Nogaus* form, short and thickset. Carapace horseshoe-shaped, three-sevenths of the entire length, and including the lobes a little longer than wide, with a squarely truncated posterior margin. Frontal plates distinct, separated from the carapace by well-defined grooves, narrowed to a point on the median line, but increasing in width toward the lateral margins, where each ends in a rounded lobe projecting over the base of the antenna; a well-defined but shallow sinus on the median line between the plates. Lateral areas narrow,

with the transverse groove considerably posterior to the center. Posterior lobes long, narrowed posteriorly, and curved slightly inward, projecting over two-thirds of the length of the fused second and third thorax segments, and bordered with an exceptionally wide transparent margin.

Eyes separated, placed well forward, and arranged in a semicircle, the median one posterior.

Second and third thorax segments fused, with only a faint dorsal groove to indicate the union, and no rounding of the anterior corners of the third segment. These fused segments are three-fifths the width and half the length of the carapace, with a good-sized lobe projecting from the lateral margin on either side near the center, which represent the lobes commonly found at the posterior corners of the second segment in *Nogaus* forms. Fourth segment free, three-fifths of the width of the fused segments, with both the anterior and posterior corners rounded in the usual manner.

Genital segment the same length and width, which is seven-ninths the width of the fourth segment, narrowed anteriorly and posteriorly with a slight protuberance on each lateral margin near the posterior end.

Abdomen triangular, two-thirds the width of the genital segment and nearly twice as wide as long; anal laminæ small and semicircular, each armed with four plumose setæ of about the same length.

Appendages similar to those of the female, except for the usual sex modifications.

Maxillipeds with a second large claw in place of the pad borne by the female, the two claws shutting past each other like a pair of scissors. Swimming legs with plumose setæ as well as spines and with a small spine on the basal joint outside of each exopod.

Total length, 3 mm. Carapace (including posterior lobes), 1.75 mm. long, 1.62 mm. wide. Fused segments, 0.62 mm. long, 1 mm. wide. Genital segment, 0.5 mm. long and wide. Color (preserved material), a uniform cinnamon brown, becoming lighter and yellowish in the thinner portions of the carapace.

(*pinguis*, stout, plump.)

This is the first male to be described for the genus *Achtheinus*, and as it establishes a new genus type among the *Nogaus* forms we may make for it the following diagnosis, corresponding to those already established for other genera: ¹

Genus *Achtheinus* (male).—Carapace large horseshoe-shaped, without conspiciilla or accessory lobes. Genital segment not enlarged; two pairs of legs visible dorsally; abdomen one-jointed, triangular; anal laminæ very small and semicircular; legs all biramose, rami of first three pairs two-jointed, of fourth pair one-jointed; maxillæ broad and

¹ Proc. U. S. Nat. Mus., vol. 33, 1908, p. 446.

lamine; maxillipeds moderately swollen, with two stout claws, shutting past each other like scissor blades.

Achtheinus pinguis, new male type.

This species is readily distinguished from *oblongus* by the shorter and wider carapace, by the separation of the two pairs of thoracic plates to their very base, by the great enlargement of the genital segment in the female, and by the accessory lobes at the base of the abdomen. It differs from *dentatus* in its relatively shorter and plumper form, in the fact that the carapace is as wide as the two pairs of thorax plates, in the shape of the posterior sinus of the genital segment, and in the fact that its second antennæ are not toothed.

Three females and two males were obtained by the American Museum of Natural History through Dr. L. Hussakof from the pectoral fin of a sawfish, *Pliotrema warreni*, off the Cape of Good Hope in 40 fathoms of water.

Two of the females and one male become the types of the species and are retained by the American Museum, the other male and female are made cotypes and are deposited in the United States National Museum under Cat. No. 42302, U.S.N.M.

ACHTHEINUS DENTATUS Wilson.

Achtheinus dentatus WILSON, Proc. U. S. Nat. Mus., vol. 39, 1911, p. 630, pl. 67.

Another finely preserved female of this species has been taken from the tail of one of the cow sharks, *Notorhynchus maculatus*, on the California coast. It has been given Cat. No. 42274, U.S.N.M., and is worthy of record because it was obtained from a new host and one which is common on our own western coast. This makes the species North American, although the types were obtained off the coast of Peru in South America.

CALIGUS PHIPSONI Bassett-Smith.

Caligus phipsoni BASSETT-SMITH, Ann. and Mag. Nat. Hist., ser. 7, vol. 1, p. 7, pl. 3, figs. 3 and 4.

Plate 32, fig. 22, and plate 33, figs. 23 to 27.

Both sexes of this species were obtained by Smith from the inner surface of the gills of *Cybbium guttatum* at Bombay and were described in the above-mentioned paper. Since his text and figures do not agree in several particulars, and since his description omits some of the most important characters, the following notes are here presented as supplementary. They are based upon specimens taken from the gills of *Polynemus tetradactylus*, at Batavia, Java, by Dr. Owen Bryant and Mr. William Palmer. These specimens have been placed in the National Museum and numbered 42304, U.S.N.M.

Smith states that his species "resembles *C. irritans* Heller, but differs in having the cephalothorax rather broader, the furcula larger, the abdomen single-jointed, and in the arrangement of the bristles on the caudal plates."

With the exception of the jointing of the abdomen, these differences are varietal rather than specific, nor do Smith's figures add anything further. But the female of *phipsoni* has a maxillary hook so small that it was entirely overlooked by Smith, while in *irritans* the hook is nearly as large and prominent as the second antennæ. In *phipsoni* the first maxillæ are broadly triangular, destitute of the rudimentary exopod, and do not reach the tip of the mouth tube; in *irritans* they are abruptly narrowed close to the base; they have a large rudimentary exopod, and they reach far beyond the tip of the mouth tube.

This latter is relatively very much wider in *irritans*, and the chitin framework is altogether different in the two species.

In the male *phipsoni* the maxilliped is scarcely larger than that of the female and no different; in *irritans* the maxilliped of the male is greatly enlarged, and its basal joint is armed with two or three wicked spines or catches, into which the terminal claw shuts.

The third legs of the two species differ in size, shape, and the number and arrangement of the plumose setæ and spines. In *phipsoni* the rami of these legs are so widely separated and project so little from the basal apron as to be invisible in dorsal view; in *irritans* they are quite prominent and much closer together. In the fourth legs of the present species the three claws on the terminal joint are all about the same length and a trifle shorter than those at the outer corners of the second and third joints. Smith makes no mention of the first maxillæ, which are broad and sharp-pointed, with the shape of an equilateral triangle.

PARAPETALUS HIRSUTUS (Bassett-Smith).

Caligus hirsutus BASSETT-SMITH, Ann. and Mag. Nat. Hist., ser. 7, vol. 1, p. 6, pl. 3, figs. 1 and 2.

Plate 33, figs. 28 to 35.

Both sexes of this species were found in the gill cavity of *Polyne-mus tetradactylus* at Bombay, India, by Bassett-Smith and were described by him as a new species of *Caligus*. But they belong to the genus *Parapetalus* rather than *Caligus* for the following reasons: 1. The genital segment is prolonged at the posterior corners into a broad, two-lobed wing, and the sides of the abdomen also are flattened into broad wings. 2. The grooving of the carapace is different from that found in *Caligus*, or in any of the Caliginæ, and resembles much more that in the Euryphorinæ. 3. The fourth legs are short and thickset, and the three terminal joints are solidly fused and armed with winged spines. 4. The egg strings are long and thread-like, similar to those of *Lernanthropus*, and not at all like the comparatively plump strings of *Caligus* and *Lepeophtheirus*.

Besides locating his specimens in the wrong genus, Smith made several blunders in describing them. Of the female he states "Cephalothorax oval, nearly twice as long as broad, about one-third the

total length" (p. 7). But his figure, as well as the one here published, shows that the cephalothorax is elliptical rather than oval and of nearly the same width and length. A little further on the same page he adds, "Palp at the base of first maxilliped long and sharp." His figure and the one here given show that this "palp" is really the first maxilla and is not connected at all with the "first maxilliped." In describing the fourth legs he states that the last joint has "on its inner border three setæ." In his enlarged figure of these legs he has represented four setæ on the last joint, none on the third joint, and one on the second joint. Of course the setæ are on the outer border instead of the inner, and in the present specimens there are three on the last joint, one on the third, and one on the second, in accordance with his description but at variance with his figure. He says nothing about the egg strings and shows only the stumps of them in his figure. But they are narrow and threadlike and as long as the entire body. The eggs are thin and very similar to those of *Lernanthropus* and other Dichelestiids, and not at all like those of *Caligus*.

In the grooving of the dorsal surface of the carapace the sides of the H are extremely irregular, the lower half being strongly convex outward, while the upper half runs to a notch on either side in the edge of the carapace. This is not like *Caligus*, but does resemble that found in the Euryphorinæ.

The present specimens include two females with egg strings, taken from the same host, *Polynemus tetradactylus*, at Batavia, Java. They have received the catalogue number 42295, U.S.N.M.

LERNANTHROPUS LAPPACEUS, new species.

Plate 34.

Female.—General body form elongate and pear-shaped, considerably widened posteriorly; cephalothorax ovate, one-fifth the entire length, only two-thirds as wide as the remainder of the thorax; carapace projecting strongly at the sides and in front and rolled ventrally over the mouth parts and the first two pairs of swimming legs.

Second and third segments thoroughly fused, with no signs of demarcation, the two together barrel-shaped, with strongly convex sides. Dorsal plate of the fourth segment twice the width of the fused second and third segments, oval in outline, with a squarely truncated posterior margin which considerably overlaps the bases of the egg strings and the fourth and fifth legs.

Fifth segment, genital segment, and abdomen short and broad, but well defined; anal laminæ short, conical, and unarmed. Egg strings narrow and one-third as long again as the entire body; eggs thin, about 150 in each string.

First antennæ short and slender, only partially visible in dorsal view; second pair stout, the basal joint considerably longer than the terminal claw. First maxillæ stout, the terminal joint as thick as the basal and tipped with three spines, the central one of which is longer and stouter than the other two; second maxillæ with a slender terminal claw. Basal joint of the maxillipeds much swollen; terminal claw conical, shorter than the basal joint, and slightly curved.

Exopods of the first two pairs of legs wider than the endopods and considerably flattened. First exopod armed with five short and sharply conical spines; second exopod also with five spines which are narrow and bluntly pointed. Endopods of both pairs with a stout, pear-shaped basal joint about as long as the exopod, and a stout terminal spine half as long again as the basal joint. Third legs of the usual plicate form, short and stout and projecting at right angles to the body axis. Fourth legs projecting half their length behind the posterior margin of the dorsal plate; rami flattened and armed posteriorly around their margins with a broad band composed of rows of papillate processes, each of which bears from three to five short and sharp spines. So far as known no armature of this sort has ever been observed on any other species of the genus. Consequently this character alone will serve to distinguish the present species, since it is very prominent.

Color a brownish-yellow without pigment; egg strings dark cinnamon-brown.

Total length (including fourth legs), 6 mm. Width of fourth dorsal plate, 2.15 mm. Length of cephalothorax, 0.9 mm. Width, 0.9 mm. Length of egg strings, 8 mm.

Male.—General body form oblong, two and a half times as long as wide, somewhat widened posteriorly; cephalothorax nearly circular, a trifle wider than long with the lateral margins flattened; antennal area very short but projecting well laterally. Free thorax, genital segment, and abdomen well fused, without transverse grooves, but with marginal invaginations indicating the segments; genital segment much narrower than the free thorax; anal laminæ narrow, conical, and unarmed. Mouth-parts and legs like those of the female, with these differences: The second antennæ are larger and stouter; the terminal claw of the maxillipeds is relatively longer and more abruptly curved; the third legs are directed diagonally backwards; the spiny processes are lacking on the inner margins of the fourth legs.

Color as in the female, but a little lighter.

Total length (including fourth legs), 2 mm. Width of cephalothorax, 0.51 mm. Width of fourth segment, 0.75 mm.

(*lappaceus*, burrl like, that is, armed with prickles like a burr, alluding to the fourth legs.)

Three females and two males, all excellently preserved, were obtained from the gills of *Polynemus tetradactylus* at Batavia, Java. One female has been numbered 42303, U.S.N.M., and becomes the type of the new species. The other two females and the two males have received the catalogue number 42326, U.S.N.M., and become cotypes.

In addition to the spiny processes this species is further distinguished by the strong narrowing of the cephalothorax and the widening of the fourth dorsal plate. All the specimens of both sexes were found fastened to the outside of the gill filaments, close to the upper end of the gill arch.

EXPLANATION OF PLATES.

PLATE 30.

Male and female of *Argulus ingens*, new species.

- Fig. 1. Dorsal view of male.
2. First and second antenna of female.
3. Maxilliped.
4. Bases of the four pairs of swimming legs of the male, showing accessory sexual organs.
5. Respiratory areas.
6. Three of the supporting rods in the edge of the sucking disk.

PLATE 31.

Female of *Argulus ingens*, new species, and male of *Achtheinus pinguis*, new species.

- Fig. 7. Dorsal view of female of *Argulus ingens*.
8. Dorsal view of male of *Achtheinus pinguis*.
9. Mouth tube and first maxillæ of the same.
10. Maxilliped.
11-14. First, second, third, and fourth swimming legs.

PLATE 32.

Females of *Achtheinus pinguis*, new species, and *Caligus phipsoni* Bassett-Smith.

- Fig. 15. Dorsal view of female of *Achtheinus pinguis*.
16. Maxilliped of same.
17-20. First, second, third, and fourth swimming legs.
21. Ventral view of genital segment and abdomen, showing the cement glands and rudimentary fifth and sixth legs.
22. Dorsal view of female of *Caligus phipsoni*.

PLATE 33.

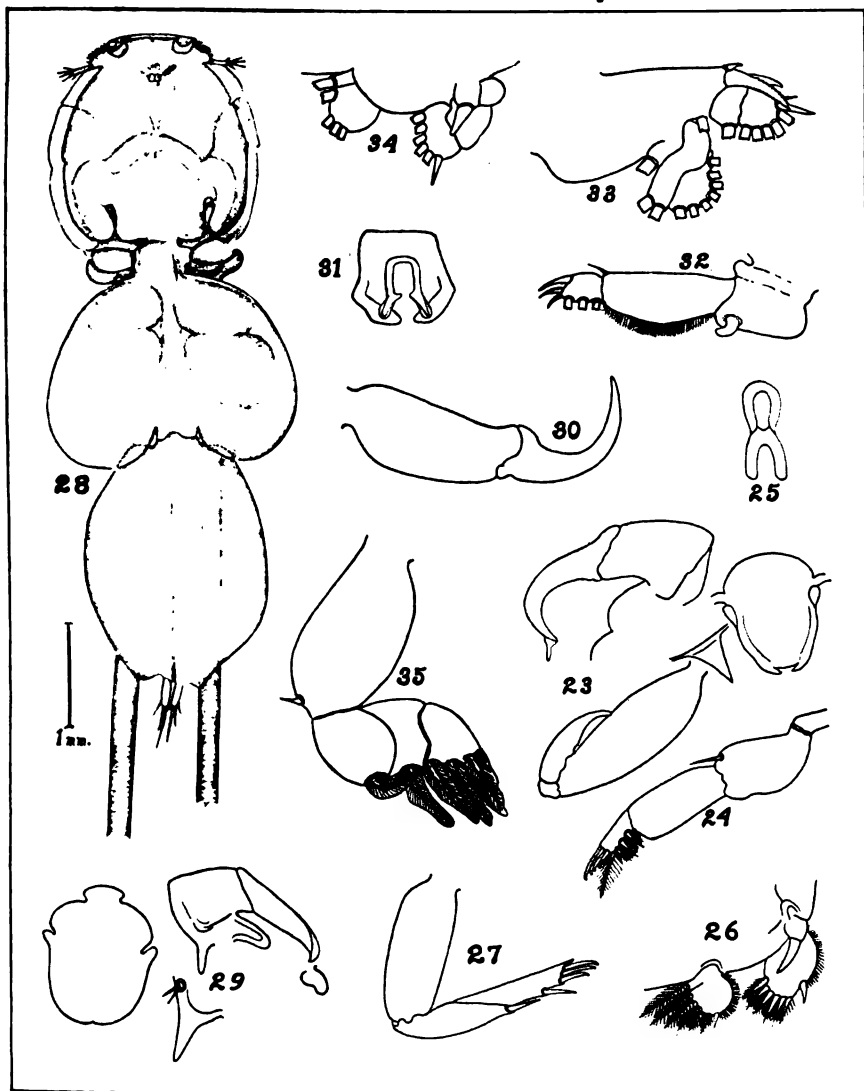
Females of *Caligus phipsoni* and *Parapetalus hirsutus* (Bassett-Smith).

- Fig. 23. Second antenna and mouth-parts of *Caligus phipsoni*.
24. First swimming leg.
25. Furca.
26 and 27. Third and fourth swimming legs.
28. Dorsal view of female of *Parapetalus hirsutus*.
29. Second antenna, maxillary hook, mouth-tube, and maxilla.
30. Maxilliped.
31. Furca.
32-35. First, second, third, and fourth swimming legs.

PLATE 34.

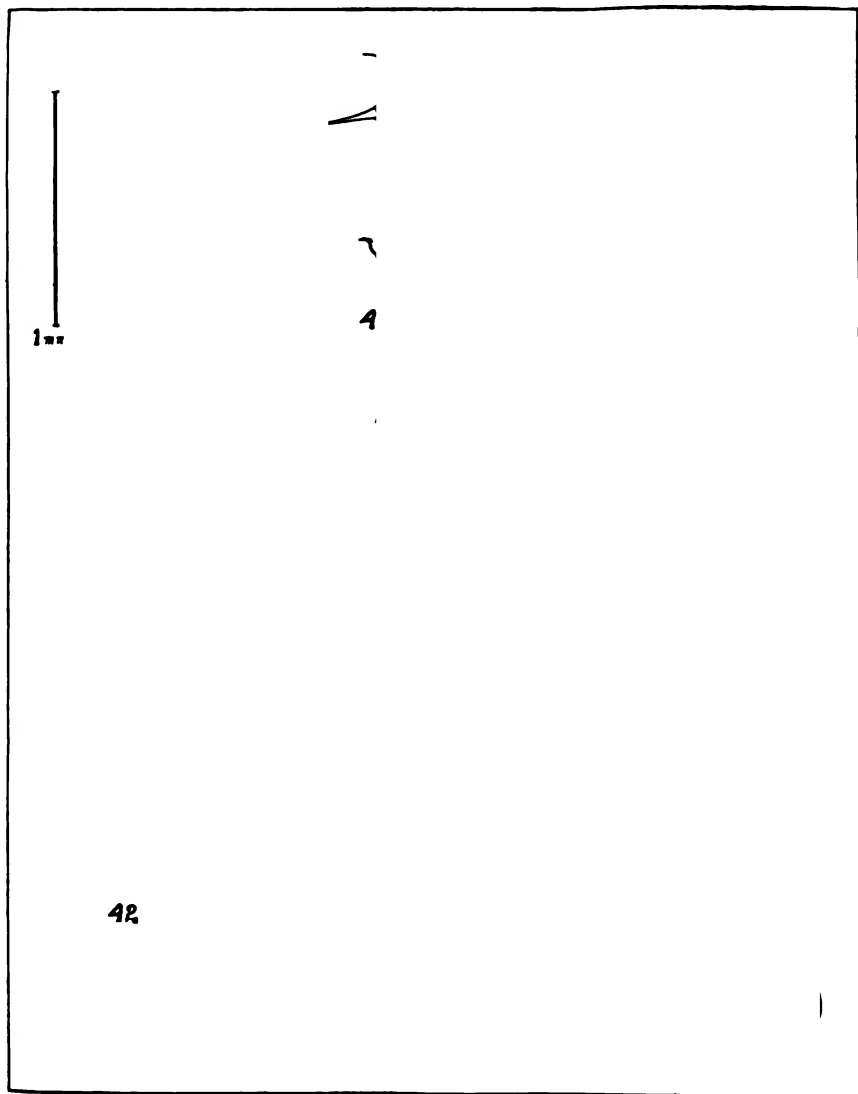
Male and female of *Lernanthropus lappaceus*, new species.

- Fig. 36. Dorsal view of male.
- 37. Dorsal view of female.
- 38. Mouth-parts of male.
- 39. Maxilliped of female.
- 40 and 41. First and second swimming legs.
- 42. Portion of ventral surface of fourth leg enlarged to show the small papillæ armed with sharp spines.



FEMALES OF CALIGUS PHIPSONI AND PARAPETALUS HIRSUTUS.

FOR EXPLANATION OF PLATE SEE PAGE 242.



MALE AND FEMALE OF LERNANTHROPUS LAPPACEUS.

FOR EXPLANATION OF PLATE SEE PAGE 243.

NOTES ON FRESH-WATER COPEPODA IN THE UNITED STATES NATIONAL MUSEUM.

By C. DWIGHT MARSH,

Of the United States Department of Agriculture, Washington.

The collections on which these notes are based have been in the United States National Museum for some years, and most of them were obtained in connection with the work of the United States Fish Commission. The Florida collections were made by Dr. W. C. Kendall, those from Sodus Bay by Mr. A. C. Weed; the Mississippi, Louisiana, and Axton, New York, material was obtained by Dr. B. W. Evermann, and the western collections by Doctor Evermann, Drs. Evermann and Meek, Meek and Alexander, and Messrs. Cox and Ulrich.

Following is a list of the localities in which copepods were found and the names of the species identified in each:

COPEPODA FOUND IN PLANKTON COLLECTIONS RECEIVED FROM UNITED STATES NATIONAL MUSEUM IN 1911.

Woods Hole, Massachusetts, fresh-water pond:

Diaptomus leptopus, var. *piscinæ* Forbes.

Cyclops viridis, var. *americanus* Marsh.

Sodus Bay, New York:

Hotel dock, Leroy's Island, to sandbar—

Diaptomus reighardi Marsh.

Cyclops albidus Jurine.

Cyclops viridis, var. *brevispinosus* Herrick.

Sand bar to south end of Nub Island—

Diaptomus reighardi Marsh.

Cyclops viridis, var. *brevispinosus* Herrick.

East side, Leroy's Island—

Cyclops albidus Jurine.

Cyclops serrulatus, var. *elegans* Herrick.

Cyclops leuckarti Claus.

Cyclops viridis, var. *brevispinosus* Herrick.

Diaptomus reighardi Marsh.

South end of Nub Island to hotel dock, Leroy's Island—

Cyclops viridis, var. *brevispinosus* Herrick.

Cyclops albidus Jurine.

Diaptomus reighardi Marsh.

Axton, New York:

Rock Pond—

Cyclops leuckarti Claus.*Cyclops strenuus* Fischer.

Pickerel Pond—

Cyclops leuckarti Claus.

Lake George, Florida:

South end—

Eurytemora affinis Poppe.*Cyclops prasinus* Fischer.*Cyclops*, immature, probably *leuckarti*.*Diaptomus*, immature.

Four miles south of Draytons Island—

Cyclops prasinus Fischer.*Diaptomus*, immature, probably *dorsalis* Marsh.

Middle of lake—

Diaptomus dorsalis Marsh.*Cyclops leuckarti* Claus.

Lake Monroe, Florida:

Middle—

Diaptomus dorsalis Marsh.*Cyclops leuckarti* Claus.

Upper end—

Diaptomus dorsalis Marsh.*Cyclops leuckarti* Claus.

Middle, between Sanford and Enterprise—

Diaptomus dorsalis Marsh.*Cyclops leuckarti* Claus.

Just below railroad wharf—

Cyclops serrulatus Fischer.

Little Lake George, Florida:

Opposite Beecher Point—

Eurytemora affinis Poppe.*Diaptomus dorsalis* Marsh.*Cyclops prasinus* Fischer.*Cyclops leuckarti* Claus.

No locality indicated—

Eurytemora affinis Poppe.*Diaptomus dorsalis* Marsh.*Cyclops leuckarti* Claus.*Cyclops serrulatus* Fischer.*Cyclops prasinus* Fischer.

Station No. 3, at black beacon 65—

Eurytemora affinis Poppe.*Cyclops prasinus* Fischer.*Diaptomus dorsalis* Marsh.

Locality illegible—

Eurytemora affinis Poppe.*Cyclops prasinus* Fischer.*Diaptomus dorsalis* Marsh.

About middle—

Cyclops prasinus Fischer.

Station No. 1, black beacon 67—

Eurytemora affinis Poppe.*Cyclops leuckarti* Claus.

St. John's River, Florida:

Opposite Palatka—

Cyclops prasinus Fischer.*Cyclops*, immature, probably *leuckarti*.*Diaptomus*, immature.

Fort Gates—

Eurytemora affinis Poppe.*Cyclops prasinus* Fischer.*Diaptomus dorsalis* Marsh.

Black Bayou, Mississippi:

Eurytemora affinis Poppe.*Cyclops albidus* Jurine.

Flat Lake, Louisiana:

Cyclops albidus Jurine.*Eurytemora affinis* Poppe.

San Marcos, Texas:

Cyclops albidus Jurine, immature.

Saginaw River, Michigan:

Cyclops serrulatus Fischer.*Cyclops albidus* Jurine.

Gambelis Lake, Idaho:

Epischura nevadensis Lilljeborg.*Cyclops serrulatus* Fischer.*Cyclops leuckarti* Claus.*Cyclops albidus* Jurine.

Lake Pend Oreille, Idaho:

July 6—

Cyclops bicuspidatus Claus.*Diaptomus ashlandi* Marsh.*Epischura nevadensis* Lilljeborg.

Mountain Creek, June 27—

Epischura nevadensis Lilljeborg.*Diaptomus ashlandi* Marsh.

Alturas Lake, Idaho:

8 p. m.—

Diaptomus, no mature males, probably *tyrelli* Poppe.*Cyclops viridis* Jurine.

6.30 p. m.—

Diaptomus, numerous, immature.*Cyclops viridis*, var. *americanus* Marsh.

8.10 a. m.—

Diaptomus, numerous, immature, probably *tyrelli* Poppe.*Cyclops viridis*, var. *americanus* Marsh.

7 p. m.—Same as above.

8 p. m.—Same as above.

Lake Washington, Washington, east side:

Diaptomus ashlandi Marsh.*Epischura nevadensis* Lilljeborg.

Tiltcoos Lake, Oregon:

Epischura nevadensis Lilljeborg.

Crater Lake, Oregon, towing from landing to island:

Diaptomus, one female, perhaps *franciscanus* Lilljeborg.

Del Monte Lake, Monterey, California:

Cyclops viridis, var. *americanus* Marsh, 2 specimens.

Hocketts Lake, California (in Kern River region):

No copepods, but from other collections from Hocketts Lake were identified—

Cyclops albidus Jurine.

Cyclops serrulatus, var. *montanus* Brady.

Diaptomus signicauda Lilljeborg.

While most of the localities are new for the species, in the majority of cases no special significance is to be attached to the new facts of distribution. *Cyclops bicuspidatus*, *C. leuckarti*, *C. albidus*, *C. serrulatus*, and *C. prasinus* occur not only all over the United States, but are common in Europe and Asia, while some of these species extend their range to Africa without any change of structure. *C. viridis* in its varieties *brevispinosus* and *americanus* occurs everywhere in the United States. The localities for *Epischura nevadensis*, *Diaptomus ashlandi*, and *D. tyrelli* are not new. The localities of the other species, however, are of particular interest and justify the more extended statement following.

DIAPTOMUS LEPTOPUS, var. PISCINÆ Forbes.

This variety was originally described from collections made in Montana. It has also been found in Manitoba, Alberta, and Colorado. *Diaptomus leptopus* has seemed to be confined largely to the Mississippi Valley, although it has been reported from Massachusetts. *Diaptomus leptopus*, var. *piscinæ* has not before been reported from the eastern United States, so that its occurrence at Woods Hole is a matter of some interest.

DIAPTOMUS DORSALIS Marsh.

This species was first found in collections made by Prof. E. A. Birge in southern Louisiana, and up to the present time this has been the only locality for the species. Its occurrence, therefore, in great numbers in the collections made in Florida is of importance as extending the range of the species, because without doubt it will be found at intervening points. It was found in Little Lake George, Lake Monroe, and in the St. Johns River as far down as Palatka.

DIAPTOMUS REIGHARDI Marsh.

Specimens of this species were found in the collections made by Mr. A. C. Weed in Sodus Bay, New York, July 26 and August 9, 1909. These specimens are of much interest. *D. reighardi* was described from material collected from a lake on Beaver Island in Lake Michigan, and from Intermediate Lake, in the northern part of the southern peninsula of Michigan. It was later found in collections made by Dr. R. H. Ward in Crooked Lake, Michigan. Although extensive collections have been made in the other lakes of Michigan and in Lake Michigan, it has never been found in any other locality, and the supposition has been that it was a rather closely localized species. From its

occurrence in Sodus Bay it is assumed that it will eventually be found in bodies of water between Michigan and New York, and from the fact that Sodus Bay is connected with Lake Ontario it might be expected in that lake. The New York specimens correspond in every detail with those found in Michigan.

EURYTEMORA AFFINIS Peppé.

This species is found very abundantly in many places on the coast of Europe, in salt, brackish, and fresh waters. It was first reported in America by Herrick,¹ who says that it lives in the shallow bays and estuaries along the Gulf of Mexico. Foster,² 1904, gives definite localities near New Orleans, and Pearse,³ 1906, records its occurrence on Nantucket Island, Massachusetts. Therefore its occurrence in great numbers, in the museum collections from the St. Johns River and Little Lake George, is no more than would be expected. Its occurrence in Flat Lake, Louisiana, and Black Bayou, Mississippi, however, is of a good deal of interest. Flat Lake is about 40 miles from the Gulf, while Black Bayou is more than 200 miles from the Gulf, and has an elevation of 144 feet. Inasmuch as *Eurytemora affinis* is commonly considered a salt-water form which is capable, after migration, of continuing its existence in brackish or fresh water, it is rather surprising to find it at a place so remote from salt water as Black Bayou.

It may be noted, in this connection, that Nordqvist⁴ states that *Eurytemora lacustris* is found in lakes from 207 to 252 meters above the sea.

CYCLOPS STRENUUS Fischer.

Cyclops strenuus FISCHER, Bull. Soc. Imp. Moscou, vol. 24, 1851, pp. 419-425, pl. 9, figs. 12-22.—G. O. SARS, Forh. Vid. Selsk. Christiania, 1863, p. 236.—BRADY, Mon. Copepoda Brit. Isles, vol. 1, 1878, pp. 104-105, p. 119, figs. 1-7.—HERRICK, 12th Ann. Rept. Geol. Nat. Hist. Surv. Minnesota, 1884, p. 147.—DADAY, Math. és természettud. Közl. Vonatk. a haz. viszony., 1885, pp. 216-218.—VOSSELER, Jahresh Ver. vat. Nat. Württemberg, 22 Jahrg., 1886, p. 195, pl. 14, figs. 18-22.—RICHARD, Rev. Sci. Bourbonnais, vol. 1, 1888, pp. 61-62.—LANDE, Materyjaly do Fauny Skorupiakov Widlonogich Krolestwa Polskiego. Widlonogi Swobodnie Zyjace. I, Rodzina Cyclopy, 1890, pp. 53-55, pl. 21, figs. 156-163, 165.—SCHMEIL, Zeitschr. Naturw. Halle, vol. 64, 1891, p. 24.—BRADY, Nat. Hist. Trans. Northumberland, Durham, and Newcastle-upon-Tyne, vol. 11, 1891, p. 73, pl. 2, figs. 1-4.—RICHARD, Ann. Sci. Nat. Zool., vol. 21, 1891, pp. 227-228, pl. 6, fig. 18.—SCHMEIL, Deutschlands freilebende Süßwasser-Copepoden, Part 1. Cyclopidae, 1892, pp. 39-51, pl. 2, figs. 12-15.—LANDE, Mem. Soc. Zool., vol. 5, 1892, p. 161.—RICHARD, Rev. Biol. Nord de la France, vol. 5, 1893, p. 4.—SCHMEIL, Abh. Naturf. Ges. Halle, vol. 19, 1893-5, pp. 20-23.—HERRICK, Second Rept. State Zool. Minn., 1895, p. 99, pl. 23, figs. 12-13.—STEUER, Verh. Zool.-bot. Ges., Wien, 1897, p. 4.—MATILE, Bull.

¹ Twelfth Ann. Rept. Geol. and Nat. Hist. Surv. Minn., 1884, p. 182.

² Second Rep. Gulf Biol. Station, pp. 73-74.

³ Amer. Naturalist, vol. 40, p. 242.

⁴ Die Calaniden Fimlands, 1888, p. 57.

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- Cyclops brevicaudatus* CLAUS, Das genus Cyclops, 1857, pp. 34-35, fig. 12; Die frei lebenden Copepoden, 1863, p. 100.—LUBBOCK, Trans. Linn. Soc. London, vol. 24, 1863, pp. 200-201.—FRIß, Arch. Naturw. Land. Böhmen, vol. 2, 1872, Abth. 4, p. 221, fig. 15.—HOEK, Tijdsch. Ned. Dierk. Ver., vol. 3, 1876, pp. 15-17, pl. 2, figs. 1-9.
- Cyclops furcifer* CLAUS, Arch. f. Naturg., Jahrg. 23, vol. 1, 1857, p. 208-209, pl. 11, figs. 14-16.
- Cyclops scutifer* G. O. SARS, Forh. Vid. Selsk. Christiania, 1863, p. 237.—LILLJEBORG, Kongl. Svenska Vet.-Akad. Handl., vol. 35, 1901, p. 33, pl. 2, figs. 26-27.
- Cyclops abyssorum* G. O. SARS, Forh. Vid. Selsk. Christiania, 1863, p. 238.—BRADY, Nat. Hist. Trans. Northumberland, Durham, and Newcastle-upon-Tyne, vol. 11, 1891, p. 73, pl. 3, figs. 1-9.
- Cyclops clausii* LUBBOCK, Trans. Linn. Soc. London, vol. 24, 1863, pp. 201-202, pl. 31, figs. 12-14.
- Cyclops vicinus* ULJANIN, Schrift. Ges. Freunden Naturw. Moskau, vol. 11, 1875, pp. 30-31, pl. 10, figs. 1-7.—LANDE, Materyjaly do Fauny Skorupiakov Widlonogich Krolestwa Polskiego. Widlonogi Swobodnie Zyjące, I, Rodzina Cyclopy, 1890, pp. 47-49, pl. 16, figs. 33-41; pl. 21, fig. 164.—BRADY, Nat. Hist. Trans. Northumberland, Durham, and Newcastle-upon-Tyne, vol. 11, pt. 1, 1891, p. 12, pl. 1, figs. 6-9.—LILLJEBORG, Kongl. Svenska Vet.-Akad. Handl., vol. 35, 1901, p. 26, pl. 2, figs. 16-19.
- Cyclops fedtschenkoi* ULJANIN, Schrift. Ges. Freunden Naturw. Moskau, vol. 11, 1875, pp. 31-32, pl. 12, fig. 10.
- Cyclops pulchellus* BRADY, Mon. Copepoda Brit. Isles, vol. 1, 1878, pp. 107-108, pl. 17, figs. 1-3.
- Cyclops claudiopolitanus* DADAY, Math. és természettud. Közl. Vonat. a haz. viszony, 1885, pp. 227-229, pl. 1, figs. 14-18.
- Cyclops hungaricus* DADAY, Math. és természettud. Közl. Vonat. a haz. viszony, 1885, pp. 230-233, pl. 2, figs. 9-12.
- Cyclops bodamicus* VOSSELER, Jahresh. Ver. Vat. Nat. Württemberg, 22 Jahrg., 1886, p. 193, pl. 5, figs. 13-18.
- Cyclops lucidulus* VOSSELER, Jahresh. Ver. Vat. Nat. Württemberg, 22 Jahrg., 1886, p. 196, pl. 5, figs. 1-12.—THALLWITZ, Jahresh. ornith. Beobacht. Stat. Sachsen, vol. 5, 1890, p. 80.
- Cyclops quadricornis* SOSTARIC, Rad. jugoslav. akad., vol. 92, 1888, pp. 62-64, pl. 1, fig. 5.
- Cyclops strenuus*, var. *vicina* FRIß and VÁVRA, Arch. Naturw. Land. Böhmen, vol. 9, 1893, pp. 57-58, figs. 44a and 44b.
- Cyclops miniatus* LILLJEBORG, Kong. Svenska Vet.-Akad. Handl., vol. 35, 1901, p. 24, pl. 2, figs. 13-15.
- Cyclops kolensis* LILLJEBORG, Kong. Svenska Vet.-Akad. Handl., vol. 35, 1901, p. 21, pl. 2, figs. 11-12.

Inasmuch as *Cyclops strenuus* has not before been found in America, a somewhat detailed description of the species is given.

The cephalothorax (fig. 1) is broadly oval, the posterior segments being much wider than in most of the species of *Cyclops*; the breadth is about one-half the length. The front is markedly produced. The

posterior corners of the first and second segments in the female are rounded, the third is either slightly produced backward or rounded, while the fourth and fifth are produced outward and backward in prominent points. The form of the fourth and fifth segments of the cephalothorax is a marked characteristic of this species. The fifth segment varies considerably in its form. Figures 2 and 3 show forms from specimens collected near Damascus. Specimens from Axton duplicated these forms. The fourth and fifth cephalothoracic segments of the male do not have the characteristic form of those found in the female.

The first abdominal segment about equals in length the remaining segments of the abdomen; the anterior end, while much narrower than the last cephalothoracic segment is nearly twice as wide as the posterior. The posterior margins of all the abdominal segments except the last are dentate; the last segment is armed with minute spines.

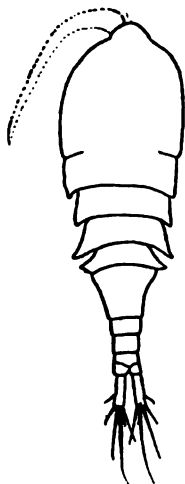
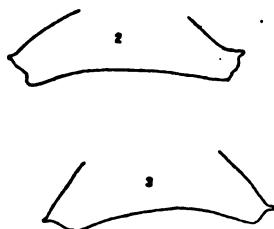


FIG. 1.—CYCLOPS STRENUUS, FEMALE. $\times 36$.



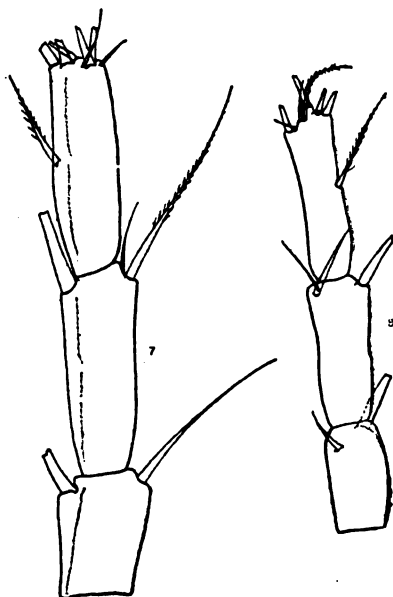
FIGS. 2-3.—CYCLOPS STRENUUS, LAST CEPHALOTHORACIC SEGMENT. $\times 73$.



FIGS. 4-5.—CYCLOPS STRENUUS. 4, FURCA OF SPECIMEN FROM SYRIA. 5, FURCA OF SPECIMEN FROM AXTON, NEW YORK. $\times 148$.

The branches of the furca are diverging, elongate, the length relatively to the rest of the abdomen being variable, but frequently equalling the last three abdominal segments. The inner margin is ciliate, and running the length of the dorsal surface, there is a somewhat irregular cuticular ridge; this ridge is not found in males or in immature specimens. The outer margin has an indentation at about one-third its length, and the lateral seta is set well toward the end. The terminal setæ are rather short and weak. Figure 4 shows the furca of a specimen from Syria and is typical in its structure. Figure 5 is from an Axton specimen and differs from the type in that it is shorter, the lateral seta is set well back from the end of the segment, and the cuticular ridge of the dorsal surface is lacking; inasmuch as no egg-bearing females were found in the Axton collections, it is probable that the specimens were not quite mature.

The first antennæ are 17-segmented and reach about to the third cephalothoracic segment. The twelfth segment has a sensory club. The last three antennal segments bear a hyaline lamella with a somewhat irregular row of very minute spines. This structure is



FIGS. 7-8.—CYCLOPS STRENUUS. 7, TERMINAL SEGMENTS OF ANTENNA OF FEMALE FROM SYRIA. 8, TERMINAL SEGMENTS OF FEMALE FROM AXTON, NEW YORK. $\times 292$.

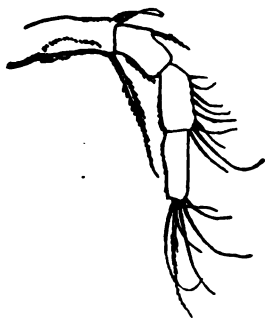


FIG. 6.—CYCLOPS STRENUUS. SECOND ANTENNA. $\times 148$.

shown in figures 7 and 8. Figure 7 is from a Syrian specimen and figure 8 is from a specimen collected at Axton, New York. These are drawn to the same scale and show the relative sizes from the two localities. The second antenna, shown in figure 6, has no distinctive characteristics.

The spinous armature of the terminal segments of the exopodites of the swimming feet is represented by the formula 3, 4, 3, 3. This formula held true in all the specimens which have passed through the author's hands. Schmeil says that it may be also 2, 3, 3, 3, or 3, 3, 3, 3. Figures 9 and 10 show the structure of the terminal segments of the second and fourth feet.

FIGS. 9-10.—CYCLOPS STRENUUS. 9, TERMINAL SEGMENT OF EXOPODITE OF SECOND FOOT. 10, TERMINAL SEGMENT OF EXOPODITE OF FOURTH FOOT. $\times 148$.

The fifth foot is composed of two segments. The basal segment is commonly broader than long, but is somewhat variable in its relative dimensions; it bears at its outer distal angle a rather short plumose seta. The second segment is about twice as long as broad; it bears at its distal extremity a long plumose seta and about midway of its inner margin a stout serrate spine; distad of the spine the segment is about half as wide as the

basal portion. There is a group of small spines at the outer distal angle of this segment and at the base of the lateral spine. Figure 11 is the fifth foot of a Syrian specimen and figure 12 the same structure from an Axton specimen, drawn to the same scale.

The form of the *receptaculum seminis* is shown in figure 13. The form of the labrum is shown in figure 14. The second row of teeth is very distinct. Not enough specimens were examined to make sure that this, which has not been mentioned by other authors, is a constant structure, but it is interesting to note that Brady¹ in his figure of the labrum has a line where the author has found minute teeth; the row of teeth by a lower magnification appears as a line.

In all the specimens examined there was an absence of the customary seta on the basal segment of the fourth swimming foot. This apparently has not been noted by other authors.

Schmeil gives as the average length of females 1.5 to 2.5 mm.

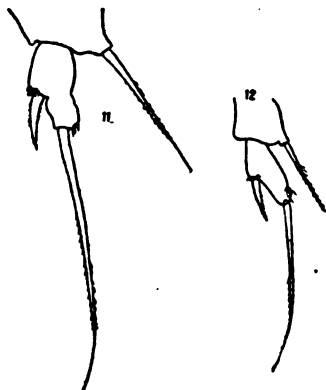
The females of the Axton collections average 1.35 mm, the largest examined measuring 1.525 mm.

Cyclops strenuus is widely distributed in Europe, Asia, and northern Africa, but has not been reported before from America. It is distinctly a cold water form occurring most abundantly in the colder months.

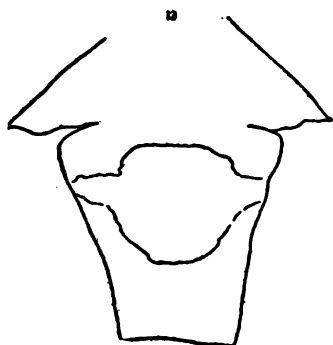
Dr. B. W. Evermann collected it in Rock Pond, Axton, New York, on April 30. It seems strange that it has never been seen before, for it is probable that it is a form of wide distribution in America.

In the synonymy, for the most part, Schmeil has been followed. Granting the limits of variation as stated by him, the species published by Lilljeborg in 1901, *scutifer*, *vicinus*, *miniatus*, and *kolensis* should be considered as varieties, and it

would be a matter of personal opinion whether or not it is worth while to recognize them under distinct names.



FIGS. 11-12.—CYCLOPS STRENUUS. 11, FIFTH FOOT OF SPECIMEN FROM SYRIA. 12, FIFTH FOOT OF SPECIMEN FROM AXTON, NEW YORK. $\times 292$.



FIGS. 13-14.—CYCLOPS STRENUUS. 13, OUTLINE OF RECEPTACULUM SEMINIS. $\times 148$. 14, LABRUM. $\times 292$.

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DESCRIPTIONS OF CERTAIN SPECIES OF WASPS OF THE FAMILY SPHECIDÆ.

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The following descriptions and notes have accumulated since the publication of my paper on this group, in the Proceedings of the United States National Museum, in 1906. Nearly all that has been added to our knowledge of the group since that time has come as the result of additions to the collections of the United States National Museum.

CELORION MANDIBULARIS (Cresson).

This species was described from a single female specimen taken in Cuba by Gundlach, and the redescription given by me¹ was prepared from the type.

Another specimen collected in Santo Domingo and now in the United States National Museum enables me to determine more definitely which characters given in the above paper are individual and which are of specific importance.

The characters in which this specimen differs from the type are as follows:

Pubescence everywhere silvery. Clypeus with a slight, bilobed median projection on its anterior margin. Greatest width of cheeks behind the eyes at about the middle of the head. Scape of antenna very faintly ferruginous below. Lateral pubescent bands of mesonotum meeting posteriorly; anterior median groove not pubescent; post-scutellar pubescence only at the sides, not in the middle; dorsum of median segment thickly clothed with white hairs and with a trace of pubescence on each side above the petiole. Abdomen about equally pointed in outline at each end; the first dorsal plate sericeous; the second, third, and fourth glistening and with a bluish reflection. Hairs on the last two abdominal plates above, brownish; terminal plate rather more acuminate than "rounded acuminate." Wings

¹ Proc. U. S. Nat. Mus., vol. 31, 1906, p. 410.

slightly fuliginous, least so basally, with a slight violet reflection. Tegulæ dark brown. Anterior coxæ pubescent in front; fore metatarsi with nine comb teeth hardly longer than half the metatarsus. All the tibiæ and tarsi very dark brown. One female, 20 mm. Otherwise as described in my paper ¹.

CHELORION RESINIPES Fernald.

This has heretofore been known only from the female. A male now in the collection of the United States National Museum, which I have examined, has made possible the preparation of the following description:

The male of this species differs from the description of the female published in 1906² as follows:

Clypeus quite long and convex, its anterior margin slightly excavated in the middle, but with a rounded projection at the central third of the excavation. The surface of this plate entirely covered with pubescence, but without any backward extension of the ferruginous color from the middle of the anterior margin. Outer ends of the longer clypeal hairs not tipped with black. Distance between the lateral ocelli equal to or slightly greater than from them to the eyes. Cheek less than half the width of the eye at its widest point. Scape of antenna faintly ferruginous beneath. Lateral mesonotal pubescent bands not meeting behind. Pubescence absent on the posterior end of the median segment and along the stigmatal groove. There is no sericeous band between the middle and hind coxæ (nor on a female in this lot). Petiole slightly bent, the projection of the curve being downward, and on its posterior third; as long as the second segment of the posterior tarsus. Abdomen dull ferruginous, darker behind; with a black spot on the first dorsal plate on each side rather toward its posterior margin, and with a median triangular spot, apex forward, at the anterior margin of the second plate (these markings are probably variable). Entire dorsal surface of the abdomen yellowish sericeous and with coarse yellowish hairs on the last two plates. Terminal plate broadly rounded in the middle and with a slight median longitudinal ridge. Beneath, plates three to seven are coarsely yellow sericeous, the hinder margins of the fourth to seventh plates emarginate, the emargination increasing posteriorly, and with the hairs longer and coarser toward the sides, almost forming lateral tufts on the sixth and seventh plates. Terminal plate truncate, rather sharply acuminate from the center of the truncation. Wings with no yellow tinge, evenly, slightly fuliginous and with a decided violet reflection. Tegulæ dark, almost black, but with traces of ferruginous

¹ Proc. U. S. Nat. Mus., vol. 31, 1906, pp. 291-423.

² Idem, p. 395.

here and there. Trochanters partly black, the hinder pair least so. Otherwise as in the female.

Length, 21 mm.

San Francisco Mountains, Santo Domingo, West Indies, June 9, 1905; Aug. Busck. collector.

CHLORION FLAVITARSIS Fernald.

It may be desirable to note here that *Chlorion flavitarsis* Fernald was given a new name in the paper on these insects in the Proceedings of the United States National Museum, mentioned above, because the specific name *flavipes* Smith was preoccupied.

CHLORION BRIDWELLI (Fernald).

A specimen from Union County, Illinois, in the collection of the University of Illinois considerably extends the range of this species beyond what has been previously recorded.

CHLORION PENNSYLVANICUM (Linnaeus).

It was stated¹ that this species should occur in the mountainous regions of Mexico. This has since been sustained by the capture of a female in Sonora, Mexico, now in the United States National Museum collection.

CHLORION CHICHIMECUM (Saunders).

The distribution of this species may now be extended, a male 20 mm. long captured at Turrialba, Costa Rica, being in the collection of Schild and Burgdorf in the United States National Museum.

CHLORION TEXANUM (Cresson).

This species has heretofore been reported only from Texas. It has been taken by C. H. T. Townsend at Meadow Valley, Mexico.

¹ Proc. U. S. Nat. Mus., vol. 31, 1906, p. 407.

1873

ADDITIONS TO THE WEST AMERICAN PYRAMIDELLID MOLLUSK FAUNA, WITH DESCRIPTIONS OF NEW SPECIES.¹

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INTRODUCTION.

The publication of the monograph on the West American Pyramidellid Mollusks in 1909, as Bulletin 68 of the United States National Museum, appears to have stimulated the workers in mollusks to further efforts in this field, for there soon followed many requests from west coast collectors for the examination of their collections and the identification of their material. This has been cheerfully done and has resulted in the addition of much new material, as well as an increased knowledge of the distribution of the species previously described. The data pertaining to the distribution of the West American Pyramidellidæ will be shortly presented for publication in a separate paper. The present paper will be confined to the presentation of the additions made since Bulletin 68 was issued, and to certain corrections of errors, mostly in citation, which have been discovered in that work.

In this connection I wish to express my thanks to all the correspondents who have sent their material to me for examination, which has made this increase of the knowledge of this group possible, and I wish to especially thank Mr. John C. Macoun, of the Geological Survey of Canada, who was kind enough to send us the shells dredged in Barkley Sound, Vancouver Island, British Columbia, which were reported upon by Dr. W. H. Dall and the present writer in Memoir No. 14 of the Department of Mines of the Geological Survey of Canada. A report on a second sending from the same general locality is now going through press. The labors of Dr. Fred Baker, Miss J. M. Cooke, Prof. F. W. Kelsey, and Mr. C. W. Gripp have added materially to our knowledge of the fauna of the San Diego region;

¹ A supplement to the monograph on this group published as Bulletin 68 of the United States National Museum December 13, 1909.

of Mr. and Mrs. T. S. Oldroyd and Mrs. B. L. Baldrige to that of San Pedro, California; and of Mr. S. S. Berry to that of the vicinity of Monterey, California. I wish also to express my sincere thanks to Mr. Tom Iredale for calling attention to certain bibliographical and other errors occurring in Bulletin 68, which are corrected in the present paper.

The accompanying drawings were made by Miss Evelyn G. Mitchell.

When the monograph was prepared several publications were not available for consultation, among them the Synopsis of the British Museum for 1840 and 1842, which made it necessary to use secondary quotations, and has led to some slight errors. Another work, by De Folin, *D'une Methode de Classification pour les Coquilles de la famille des Chemnitzidæ*,¹ had escaped our attention altogether and has only recently been made known to us by Mr. Tom Iredale.² We have been unable to find it in Washington so far, but take Mr. Iredale's assurance in the places cited that the paper we quoted as "Constit. Method. de la Fam. Chemnitzidæ, 1885," reprints the tabular classification without change. Although this makes quite a change necessary in the references to De Folin's names, it fortunately entails no change in the nomenclature in use. This second paper of De Folin we had seen in separate form only, and we are told by Iredale that it was published in 1884-85.³

The following notes will bring the bulletin up to date:

Page 8, line 22: Scacchi should read Brocchi.

Page 10: Drop the footnote and cite the subgenus as follows: *Agatha* A. Adams, Ann. Mag. Nat. Hist., ser. 3, vol. 6, 1860, p. 422. Type, *Agatha virgo* A. Adams. This was a monotypic genus at the time of description, and although the type was subsequently assigned to *Myonia*, *Menesitho*, and *Amathis* by A. Adams, must remain as the type of the present group, which is valid.

Page 11, line 22: *plicata* should read *plicatula*.

Pages 13 and 18: The subgenera *Elodiamea* De Folin and *Odostomella* Bucquoy, Dautzenberg, and Dollfus should be united, the complete synonymy reading:

Odostomella Bucquoy, Dautzenberg, and Dollfus, Moll. Roussillon, 1883, p. 167, type, *Rissoa dolioleum* Philippi, + *Elodia* De Folin, Ann. Soc. Linn. Maine et Loire, vol. 12, 1870, p. 200, = *Elodiamea* De Folin, Zool. Rec., 1885, published in 1886, p. 94, not *Elodia* Desvoidy, 1863 + *Herviera* Melvill and Standen, Journ. Conch., vol. 9, 1899.

Page 16, line 39: *gradata* should read *graduata*.

Page 17, line 22: 1853 should read 1833.

¹ Ann. Soc. Linn. Maine et Loire, vol. 12, pp. 191 et seq.

² Nautilus, vol. 24, 1910, pp. 55-6.

³ Ann. Soc. Agr. et Hist. Nat. Lyons, vol. 7, p. 209 et seq.

Page 17, line 12 *et seq.*: *Eulimella* should be cited as follows: *Eulimella* Forbes in Jeffreys, Ann. Mag. Nat. Hist., vol. 19, p. 311, April, 1847, type, *E. macandréi* Forbes = *Eulima scillæ* Scacchi.

Page 17, line 12: The date of Cossmann's paper containing the description of *Loxoptysis* has been questioned. The separates of this paper appear to have been distributed July, 1888, while the completed vol. 23 of the Ann. Soc. Roy. Malac. Belg. may have appeared later.

Page 17, line 15: Cossmann should read Deshayes.

Page 17, line 20: Our citation for *Monotygma* Gray was taken from Fischer, Man. de Conch., 1885, p. 787. No change in the nomenclature is necessary, although Gray's names published in the Synopsis of the British Museum for 1840 or 1842 are stated to be nude names.

Page 17, line 37: The reference to *Oscilla* A. Adams should be changed to read as follows:

Oscilla A. Adams, Ann. Mag. Nat. Hist., ser. 3, vol. 7, 1861, p. 296. Type, *Monotygma cingulata* A. Adams. It remains a synonym of *Cingulina* A. Adams. The spirally lirated *Odostomias* belong to the subgenus *Menestho* Möller.

Page 18, line 20: p. 59 should read p. 8.

Page 18, line 27, should read Trans. Roy. Soc. South Australia, vol. 24, 1900, p. 98.

Page 18, line 30: 1879 should read 1899.

Page 29, lines 3 and 14: *plicata* should read *plicatula*.

Page 29, line 15: *plicatus* should read *plicatulus*.

Page 134: The citation for *Salassia* should be as follows: *Salassia* De Folin, Ann. Soc. Linn. Maine et Loire, vol. 12, 1870, p. 200. Type, *Salassia carinata* De Folin (= *Odostomia* (*Salassia*) *tropidita* Dall and Bartsch.)

De Folin's tabular classification cited above and also his Constitution Méthodique, Famille des Chemnitzidæ, published in the Ann. Soc. Agri. et Hist. Nat. Lyons, vol. 7, 1884-85, pp. 209, etc., which is a duplication of the former, gives no reference to type species. In his Fonds de la Mer, vol. 1, 1870, p. 314, the nude name *Salassia carinata* occurs, which is the first species that he describes later on, Fonds de la Mer, vol. 2, 1872, p. 168, pl. 6, fig. 6. This was, therefore, accepted as type of *Salassia*.

Page 136: *Noemia* De Folin, a synonym of *Chrysallida* Carpenter, must now be cited as follows: *Noemia* De Folin, Ann. Soc. Linn. Maine et Loire, vol. 12, 1870, p. 200.

Page 184: The reference to *Jaminea* De Folin, a synonym of *Menestho*, should read *Jaminea* De Folin, Fonds de la Mer, vol. 1, 1869, p. 214. Type, *Jaminea bilirata* De Folin. Drop from the synonymic reference of *Menestho*, "+ *Jaminina* De Folin, Zool. Record, vol. 22, 1885, p. 94."

DESCRIPTIONS OF SPECIES.

TURBONILLA (CHEMNITZIA) CLARINDA, new species.

Plate 35, fig. 4, 4a.

Shell elongate-conic, bluish-white, semitranslucent. Nuclear whorls $2\frac{1}{2}$, forming a rather solute, elevated, helicoid spire, whose axis is at right angles to the succeeding turns, in the first of which it is slightly immersed. Post-nuclear whorls well rounded, appressed at the summit, marked by very regular, rounded, slightly protractive, axial ribs, of which 16 occur upon the first to seventh, 18 upon the eighth and the penultimate turn. These ribs become slightly flattened and somewhat expanded at the summit. Intercostal spaces a little wider than the ribs, well impressed, terminating a little posterior to the suture, thus leaving a plain, narrow band immediately above the suture. Sutures somewhat constricted. Periphery and base of the last whorl well rounded, smooth. Aperture subquadrate; posterior angle obtuse; outer lip thin, showing the external sculpture within; inner lip slender, slightly sinuous, and very slightly revolute.

The type and 2 additional specimens are listed as Cat. No. 211546, U.S.N.M. These and 5 other specimens, in Mr. Kelsey's collection, were dredged in 12 to 30 fathoms in San Diego Bay, California. The type has 10 post-nuclear whorls and measures: Length, 4.7 mm.; diameter, 1.1 mm.

This species follows *Turbonilla (Chemnitzia) santarosana* in the key.

TURBONILLA (STRIOTURBONILLA) DINORA, new species.

Plate 35, fig. 8.

Shell very elongate-conic, milk-white. Nuclear whorls small, at least 2, about one-third immersed in the first of the succeeding turns. Post-nuclear whorls slightly rounded, narrowly shouldered at the summit, marked by very strong, very regular, broad, rounded, slightly curved, decidedly protractive, axial ribs, of which 14 occur upon the first to seventh whorl, 16 upon the eighth and ninth, 18 upon the tenth and the penultimate turn. Intercostal spaces very strongly impressed, as wide as the ribs, terminating a little anterior to the suture. Periphery of the last whorl well rounded; base short, well rounded, marked by lines of growth and numerous, exceedingly fine, spiral striations; the latter also cross the ribs and intercostal spaces on the spire. Sutures strongly constricted. Aperture subquadrate; posterior angle obtuse; outer lip thin, showing the external sculpture within; inner lip short, somewhat curved and revolute, without apparent fold; parietal wall glazed with a thin callus.

The unique type of this species (Cat. No. 211553, U.S.N.M.) was collected by Miss J. M. Cooke on the sandspit in San Diego Bay, Cali-

fornia. It has 12 post-nuclear whorls and measures: Length, 9.2 mm.; diameter, 2.2 mm.

This species is nearest related to the *Turbonilla* (*Strioturbonilla*) *stearnsi*, a fossil species from San Diego, California, and follows *Turbonilla* (*Strioturbonilla*) *stephanogyra* in the key.

TURBONILLA (STRIOTURBONILLA) ENCELLA, new species.

Plate 35, fig. 1, 1a.

Shell small, elongate-conic, bluish-white. Nuclear whorls decolated. Post-nuclear whorls well rounded, slightly shouldered at the summit, crossed by broad, low, decidedly protractive, axial ribs, which become slightly flattened at the summit. Of these ribs, 14 occur upon the second of the remaining turns, 16 upon the third to seventh, and 20 upon the penultimate turn. Intercostal spaces a little wider than the ribs, the impressed portion terminating at a little distance posterior to the suture, leaving a narrow, plain band just above this. Suture well marked. Periphery of the last whorl and the moderately long base well rounded, the latter marked by the feeble continuations of the axial ribs, which extend to the umbilical area. Entire surface of spire and base marked by numerous, strong, rather coarse, wavy, spiral striations, which on the spire extend equally strong over the ribs and intercostal spaces. Aperture subquadrate; posterior angle obtuse; outer lip (fractured) thin; inner lip moderately strong, somewhat curved, and reflected.

The unique type of this species (Cat. No. 211547, U.S.N.M.) comes from San Pedro, California. It has 9 post-nuclear whorls remaining, having lost the nucleus and probably the first 2 post-nuclear turns, and measures: Length, 4.5 mm.; diameter, 1.2 mm.

This species recalls *Turbonilla* (*Strioturbonilla*) *stearnsi*, which occurs fossil at San Pedro. It differs from it in being much smaller and in having much stronger spiral sculpture. It follows *Turbonilla* (*Strioturbonilla*) *attrita* in the key.

TURBONILLA (STRIOTURBONILLA) BAKERI, new species.

Plate 35, figs. 10, 10a.

Shell elongate-conic, bluish-white. Nuclear whorls small, $2\frac{1}{2}$, forming a quite elevated, helicoid spire, whose axis is at right angles to that of the succeeding turns, in the first of which it is about one-fifth immersed. Post-nuclear whorls slightly rounded, narrowly shouldered at the summit, somewhat constricted at the suture, marked by very regular, strong, rounded, slightly protractive, axial ribs, which become somewhat expanded at the summit. Of these ribs, 14 occur upon the first four turns, 16 upon the fifth to tenth, 18 upon the eleventh, and 20 upon the penultimate turn. Intercostal spaces strongly impressed, almost as wide as the ribs, terminating shortly

before reaching the suture, thus leaving a narrow plain band immediately above the suture. Sutures well impressed. Periphery of the last whorl and short base well rounded, smooth, except for fine incremental lines and the numerous, exceedingly fine, closely-spaced, wavy, spiral striations which cover the entire surface of the shell. Aperture subquadrate; posterior angle obtuse; outer lip thin, showing the external sculpture within; inner lip almost straight, slightly revolute; parietal wall glazed with a thin callus.

The type (Cat. No. 211549, U.S.N.M.) has 13 post-nuclear whorls and measures: Length, 8 mm.; diameter, 1.8 mm. It and another specimen, which is in Dr. F. C. Baker's collection, came from San Diego Bay, California.

This species follows *Turbonilla* (*Strioturbonilla*) *nicholsi* in the key.

TURBONILLA (STRIOTURBONILLA) DRACONA, new species.

Plate 35, figs. 2, 2a.

Shell very elongate-conic, bluish-white. Nuclear whorls small, 2, helicoid, having their axes at right angles to that of the succeeding turns. Post-nuclear whorls well rounded, somewhat shouldered at the summit, marked by strong, somewhat curved, decidedly protractive, axial ribs, which extend undiminished from the summit to the periphery, between the sutures, while on the last whorl they continue feebly over the base. Of these ribs, 14 occur upon the first, 16 upon the second, 18 upon the third to eighth, 20 upon the ninth and tenth, and 22 upon the penultimate turn. Intercostal spaces about 1½ times as wide as the axial ribs, deep. Sutures deeply impressed, rendered sinuous by the summits of the ribs. Periphery and the short base of the last whorl well rounded, marked by the feeble continuations of the axial ribs and numerous, exceedingly fine, closely spaced, spiral striations; the latter may also be seen on the spire. Aperture moderately large, subquadrate; posterior angle obtuse; outer lip thin, showing the external sculpture within, inner lip moderately long, almost straight, provided with a very feeble fold at its insertion.

The type (Cat. No. 211548, U.S.N.M.) was collected by Mr. Kelsey at San Diego, California. It has 12 post-nuclear whorls and measures: Length, 6.9 mm.; diameter, 1.5 mm.

This species follows *Turbonilla* (*Strioturbonilla*) *serræ* in the key.

TURBONILLA (STRIOTURBONILLA) COOKEANA, new species.

Plate 35, fig. 3.

Shell elongate-conic, yellowish-white, with a darker yellow band a little posterior to the middle between the sutures. (Nuclear whorls decollated.) Post-nuclear whorls moderately rounded, somewhat exserted near the summit; marked by moderately strong rounded, slightly protractive axial ribs, of which 18 occur upon the second to fourth, 20 upon the fifth and sixth, 24 upon the seventh and eighth,

and 28 upon the penultimate turn. Intercostal spaces about $1\frac{1}{2}$ times as wide as the ribs, marked by a double series of large pits of which one is at the periphery, the other a little posterior to the middle between the sutures. In addition to these pits, the intercostal spaces are marked by 11 fine, incised lines between the summit and the median series of pits and 18 between the median and the peripheral pits. These fine incised lines are of about equal strength and spacing. They do not extend from the intercostal spaces at the suture where a very narrow band is left without sculpture. The depressed intercostal spaces and ribs terminate at the well rounded periphery of the last whorl. Suture well impressed. Base of the last whorl moderately long, marked by 24 fine incised spiral lines, which are a little closer spaced near the umbilicus than at the periphery. Aperture subquadrate; posterior angle acute; outer lip thin, showing external markings within; inner lip slightly sinuous, feebly reflected with a slender fold a little anterior to its insertion; parietal wall closed with a fine callus.

The type (Cat. No. 211550, U.S.N.M.) has ten whorls and measures: Length, 6.9 mm.; diameter, 1.7 mm. It was collected by Miss J. M. Cooke in Gulf of California and is named for her.

This species follows *Turbonilla* (*Strioturbonilla*) *gracilior* in the key.

TURBONILLA (PYRGOLAMPROS) TALMA Dall and Bartsch.

Plate 35, fig. 7.

Turbonilla (*Pyrgolampros*) *talma* DALL and BARTSCH, Dep. Mines, Geol. Surv., Canada, 1910, pp. 13-14, pl. 2, fig. 3.

Shell, broadly elongate-conic, dark chestnut brown, wax-yellow at the apex and the columellar area. Nuclear whorls decollated. Post-nuclear whorls moderately rounded, feebly shouldered at the summit, marked by strong, well-rounded, axial ribs, of which 18 occur upon each of the turns. Intercostal spaces about two-thirds as wide as the ribs, well impressed. Sutures strongly impressed. Periphery of the last whorl well rounded. Base moderately long, and well rounded, showing scarcely any traces of the axial ribs. Entire surface of spire and base crossed by numerous fine, closely spaced, spiral striations. Aperture oval; posterior angle acute; outer lip thin, showing a lighter band half way between the periphery and the summit, in the general chestnut coloration; inner lip slender, twisted and slightly revolute, white.

Two specimens of this species were dredged in Barkley Sound, Vancouver Island, British Columbia, one of which is in the Geological Survey Museum, Ottawa; the other in the collection of the United States National Museum, Cat. No. 211537. One of these has lost the nucleus, the 10 remaining whorls measuring: Length, 9 mm.; diameter, 2.8 mm.

This species follows *Turbonilla* (*Pyrgolampros*) *taylori* in the key.

TURBONILLA (PYRGOLAMPROS) GLORIOSA, new species.

Plate 35, fig. 9.

Shell very slender, elongate-conic, wax-yellow, with a broad, brown band which on the early and the later whorls extends over the anterior half, between the sutures, while on the middle ones it covers fully two-thirds of that space. Nuclear whorls decollated. Post-nuclear whorls flattened in the middle, rounding moderately toward the summit and the periphery, marked by strong, regular, retractive, axial ribs, of which 14 occur upon the second of the remaining turns, 16 upon the third, 18 upon the fourth to sixth, 20 upon the seventh and eighth, while upon the remaining volutions they become much enfeebled and less regular. These ribs upon the middle whorls are strongest in the middle, sloping gently toward the summit and the periphery, the slope at the summit lending them a shouldered effect. Intercoastal spaces deeply impressed, about as wide as the ribs. Sutures strongly impressed. Periphery of the last whorl somewhat inflated, well rounded. Base moderately long, well rounded, marked by the feeble continuations of the axial ribs. Entire surface of spire and base crossed by numerous very fine, spiral striations. Aperture subquadrate; posterior angle obtuse; outer lip thin, showing the banding of the exterior within; inner lip very oblique, slightly curved, and revolute, with an obscure fold at its insertion; parietal wall glazed with a very thin callus.

The unique type of this species (Cat. No. 211551, U.S.N.M.) was dredged by Mr. Kelsey in 12 fathoms, outside San Diego, California. It has lost the nucleus and probably the first post-nuclear turn; the 11 remaining measure: Length, 8.3 mm.; diameter, 2 mm.

The present species reminds one strongly of *Turbonilla* (*Pyrgolampros*) *chocolata* Carpenter. It has the same beautiful general coloration, but differs in having much fewer ribs and in having these shouldered, while in *chocolata* they are perfectly straight to the summit. In the present species the ribs are much more strongly retractive; in *chocolata* they are only slightly so. The present species is also smaller and much more slender.

This species follows *Turbonilla* (*Pyrgolampros*) *chocolata* in the key.

TURBONILLA (PYRGOLAMPROS) MACOUNI Dall and Bartsch.

Plate 35, fig. 11.

Turbonilla (*Pyrgolampros*) *macouni* DALL and BARTSCH, Dep. Mines, Geol. Surv., Canada, 1910, pp. 15-16, pl. 1, fig. 9.

Shell, large, very broadly elongate-conic, pale wax-yellow, with three chestnut bands. The first of these bands extends over the posterior fourth of the whorls between the sutures, and is less strongly colored than the other two which are very pronounced, about half as

wide as the first, and occupy the space immediately anterior and posterior to the periphery, the space which separates them being a little narrower than the band. Nuclear whorls small, almost 2; depressed helicoid, having their axes almost at right angles to that of the succeeding turns; scarcely at all immersed. Post-nuclear whorls flattened on the posterior two-thirds between the sutures, slightly rounded anteriorly; moderately shouldered at the summit; marked by strong, well-rounded, somewhat sinuous, almost vertical, axial ribs which are about as wide as the spaces which separate them. Of these ribs, 18 occur upon the second, 20 upon the third and fourth, 18 upon the fifth to seventh, 20 upon the eighth and ninth, 22 upon the tenth and penultimate turn. Periphery of the last whorl well rounded. Base of the last whorl moderately long, well rounded, marked by the feeble continuations of the axial ribs. Entire surface of spire and base marked by numerous, closely spaced, very fine, spiral striations. Aperture moderately large, broadly oval; posterior angle obtuse; outer lip thin, showing the external markings within; inner lip slender, moderately curved and slightly revolute; parietal wall glazed with a thin callus.

Specimens of this species were dredged in Barkley Sound, part of which are in the Geological Survey Museum collection in Ottawa, and two in the United States National Museum, where they are listed as Cat. No. 211538, U.S.N.M. One of the specimens has the nucleus and 10 post-nuclear whorls, and measures: Length, 9 mm.; diameter, 3 mm. Another has 10 post-nuclear whorls (having lost the nucleus and probably the first 2 post-nuclear turns), and measures: Length, 14.8 mm.; diameter, 4.5 mm.

In adult shells the basal band becomes much expanded, even to the extent of covering the posterior half of the base.

The present species—the finest of the west American *Pyrgolampros*—recalls *Turbonilla* (*Pyrgolampros*) *keepi* Dall and Bartsch, but is much larger than that form, with fewer and stronger ribs.

This species follows *Turbonilla* (*Pyrgolampros*) *painei* in the key.

TURBONILLA (PYRGOLAMPROS) PESA Dall and Bartsch.

Plate 35, fig. 5.

Turbonilla (*Pyrgolampros*) *pesa* DALL and BARTSCH, Dep. Mines, Geol. Surv., Canada, 1910, p. 14, pl. 2, fig. 5.

Shell, elongate-conic, small, chestnut brown, with a slightly paler, broad, obscure band half way between the sutures. Nuclear whorls decolated. Post-nuclear whorls flattened, slightly shouldered at the summit, marked by feeble, almost vertical, axial ribs, of which 22 occur upon the second, 24 upon the third, 20 upon the fourth and fifth, and 26 upon the sixth of the remaining turns. Upon the penultimate turn the ribs are subobsolete. Intercoastal spaces feebly

impressed, of irregular width. Sutures well impressed. Periphery of the last turn somewhat inflated, well rounded. Base short, well rounded. Entire surface of spire and base crossed by numerous very fine, closely spaced, spiral striations. Aperture broadly oval; posterior angle acute; outer lip thin, showing the external markings within by transmitted light; inner lip moderately strong, slightly curved and revolute.

The unique type was dredged in Barkley Sound, Vancouver Island, British Columbia. It has 8 post-nuclear whorls (having lost the nucleus, and probably the first $1\frac{1}{2}$ post-nuclear turns), and measures: Length, 6 mm.; diameter, 1.6 mm.

This species follows *Turbonilla* (*Pyrgolampros*) *halistrepta* in the key.

TURBONILLA (PYRGOLAMPROS) RINELLA Dall and Bartsch.

Plate 35, fig. 6.

Turbonilla (*Pyrgolampros*) *rinella* DALL and BARTSCH, Dep. Mines, Geol. Surv., Canada, 1910, pp. 14-15, pl. 1, fig. 2.

Shell, elongate-conic, reddish wax-yellow, a little lighter on the posterior half between the sutures; anterior half of base almost white. Nuclear whorls decollated. Posterior two-thirds of the post-nuclear whorls between the sutures flattened; anterior third rounding moderately toward the periphery; whorls marked by feebly developed, low, broad, retractive, axial ribs, which are separated by narrow, shallow, intercostal spaces. Of these ribs, 22 occur upon the fourth, 24 upon the fifth and sixth, 26 upon the seventh, and about 42 upon the last of the remaining turns. Upon the last they are very irregular and even less strongly developed than on the preceding. Suture well impressed. Periphery of the last whorl somewhat inflated, well rounded, with scarcely any traces of axial sculpture. Entire surface of spire and base marked with numerous wavy, closely spaced, spiral striations. Aperture broadly oval; posterior angle acute; outer lip thin; inner lip oblique, slender, and revolute; parietal wall covered with a fairly thick callus.

The unique type was collected in Barkley Sound, Vancouver Island, British Columbia, and is in the collection of the Geological Survey, Ottawa. It has 9 whorls remaining, which measure: Length, 8.5 mm.; diameter, 2.3 mm.

This species follows *Turbonilla* (*Pyrgolampros*) *pesa* in the key.

TURBONILLA (PYRGISCUS) GRIPPI, new species.

Plate 36, fig. 9.

Shell very elongate-conic, light chocolate brown. (Nuclear whorls decollated.) Post-nuclear whorls well rounded, slightly shouldered about one-third of the distance between the sutures, anterior to the summit, marked by rather strong, decidedly retractive, axial ribs, of

which 20 occur upon the second, 18 upon the third to sixth, 20 upon the seventh, 26 upon the eighth to tenth, and 30 upon the penultimate whorl; upon the last 5 whorls they are less regular in size and spacing than on the preceding. Intercoastal spaces about twice as wide as the ribs on the first 7 whorls, averaging a little less in width upon the remaining; the intercoastal spaces are strongly impressed, and marked with 6 strongly impressed series of spirally spaced pits, the first one below the summit being a little farther from the summit than from its neighbor; between these spiral pits occur finer incised lines, of which there are 10 between the summit and the first strong pit, 1 each between the first and second, and second and third, 2 between the third and fourth, 3 between the fourth and fifth, and 2 between the fifth and sixth; the strong incised lines pass up on the sides of the ribs, constricting the ribs where they meet them; the fine lines are not apparent upon the ribs. Sutures strongly constricted. Periphery of the last whorl well rounded. Base short, well rounded, marked by about 20 very slender incised spiral lines. Aperture oval; posterior angle obtuse; outer lip thin, showing the external sculpture within; inner lip slightly curved, oblique, reflected, but not adnate to the base; parietal wall covered with a thin callus.

The type (Cat. No. 229011, U.S.N.M.) was collected by Mr. C. W. Gripp, off San Diego, California, and measures: Length, 11 mm.; diameter, 2.7 mm.

This species follows *Turbonilla* (*Pyrgiscus*) *castanella* in the key.

TURBONILLA (PYRGISCUS) CALLIMENE, new species.

Plate 36, fig. 7.

Shell moderately large, elongate-conic, flesh colored. Nuclear whorls decollated. Post-nuclear whorls rather high between the sutures, moderately shouldered at the summit, marked by numerous, well-developed, almost vertical, axial ribs, of which 18 occur upon the second and third, 20 upon the fourth, 24 upon the fifth, 28 upon the sixth, 30 upon the seventh, and 34 upon the penultimate turn. Intercoastal spaces strongly impressed, about as wide as the ribs. In addition to the axial sculpture, the whorls are crossed by five strong lines of pits, which are distributed over the anterior two-thirds between the sutures, the intercoastal spaces on the posterior third being smooth. The anterior three of these five lines of pits are of equal strength and equally spaced; the posterior two are weaker and a little closer together than the rest, the second one being a little farther distant from the median than that is from its neighbor anterior to it. Periphery and the somewhat attenuated base of the last whorl well rounded, marked by the feeble continuations of the axial ribs and by nine incised, spiral lines, which vary considerably in strength and spacing. The first two of these, below the five already described, are of about the same strength as those immediately above the suture;

the remainder are not so wide and are less regular. Aperture moderately large, ovate; posterior angle acute; outer lip thin; inner lip oblique, somewhat curved, and slightly revolute; parietal wall glazed with a thin callus.

The type (Cat. No. 211554, U.S.N.M.) comes from San Diego Bay, California. It has lost the nucleus and probably a portion of the first post-nuclear turn; the nine remaining measure: Length, 7.2 mm.; diameter, 2.2 mm.

This species follows *Turbonilla (Pyrgiscus) tenuicula* in the key.

TURBONILLA (MORMULA) SCAMMONENSIS, new species.

Plate 36, fig. 5.

Shell elongate-conic, rather stout, pinkish. Nuclear whorls decolated. Post-nuclear whorls increasing rapidly in size at first, then subcylindric; moderately rounded on the early whorls, flattened on the later; narrowly, tabulatedly shouldered; marked with strong, regular, almost vertical, axial ribs, which extend strongly from the summit to the periphery; of these ribs, 18 occur upon the third and fourth, 20 upon the fifth, 22 upon the sixth and seventh, 24 upon the eighth, and 26 upon the penultimate whorl. On some of the whorls there is a tendency toward the formation of a low varix, due to the fusion of two ribs. Intercostal spaces a little narrower than the ribs, strongly impressed. In addition to the axial ribs, the whorls are marked with incised spiral lines; of these, five occur between the sutures upon the first six whorls, one being at the periphery, another at the middle between the sutures, and two between these; these four divide the space between them into three equal parts; the fifth spiral line is a little nearer the median spiral line than the summit, leaving a broad, plain band at the summit. On the seventh whorl there is an intercollated, fine, spiral line on the middle of the space between the median and the one anterior to it, while on the next whorl an additional spiral line makes its appearance in the same raised band and continues over the rest of the whorls. Summits of the whorls slightly cuspidate and somewhat exserted. Sutures strongly marked. Periphery of the last whorl well rounded. Base moderately long, well rounded, marked by seven equal, incised, spiral lines, which are almost equally spaced, and very feeble continuations of the axial ribs. Aperture moderately large; posterior angle acute; outer lip thickened with an internal callus, and reenforced by four strong, spiral lirations; inner lip stout, slightly curved and somewhat revolute, provided with a strong fold at its insertion; parietal wall glazed with a thin callus.

The above description is based upon two specimens collected by Mr. Henry Hemphill, in Scammon's lagoon, Lower California. One

of these shows the lirations strongly within the aperture; in the other, the greater part of the callus which should contain them has been broken away.

The figured specimen, which is in the United States National Museum, Cat. No. 211552, U.S.N.M., has eight whorls remaining which measure: Length, 7.5 mm.; diameter, 2.1 mm. The other specimen is in Mr. Kelsey's collection.

This species follows *Turbonilla (Mormula) ambusta* in the key.

ODOSTOMIA (BESLA) EXCOLPA, new species.

Plate 36, fig. 6, 6a.

Shell very small, semitranslucent, bluish-white. Nuclear whorls quite large, $2\frac{1}{2}$, forming a moderately elevated, helicoid spire, whose axis is at right angles to that of the succeeding turns, in the first of which it is about one-fourth immersed. Post-nuclear whorls decidedly rounded, with the greatest convexity falling on the anterior third of the whorls, between the sutures, appressed at the summit, marked by decidedly sinuous, slender, axial ribs, of which about 18 occur upon the first and second, 20 upon the third, and 28 upon the penultimate turn. Intercostal spaces about three times as wide as the ribs. In addition to the axial sculpture, the whorls are crossed by three equal and subequally spaced, spiral threads, which are almost as strong as the axial ribs. The first of these is situated at the posterior termination of the anterior third, between the sutures, while the third marks the periphery, the second being halfway between the two. The intersections of the spiral threads and axial ribs are slightly nodulose, while the spaces inclosed between them appear as almost square pits. Base well rounded, marked by four slender, spiral threads and the feeble continuations of the axial ribs, which extend to the umbilical area. Sutures strongly impressed. Aperture ear-shaped; posterior angle acute; outer lip thin, showing the external sculpture within; inner lip slightly curved, decidedly revolute, adnate to the base, provided with a strong, oblique fold at its insertion; parietal wall covered with a thick callus, which connects the insertion of the inner lip with the posterior angle of the aperture.

The type (Cat. No. 198903a, U.S.N.M.) was collected by Dr. Edward Palmer at the head of the Gulf of California. It has five post-nuclear whorls and measures: Length, 2 mm.; diameter, 0.7 mm.

The present species recalls *Odostomia (Besla) convexa* Carpenter, from which it differs in having the whorls much more rounded and in having the ribs decidedly flexuose, and four instead of eight spiral threads on the base.

ODOSTOMIA (CHRYSTALLIDA) HETEROCINCTA, new species.

Plate 36, figs. 4, 4a.

Shell moderately large, elongate-conic, with decidedly channeled sutures, white. Nuclear whorls at least 2, forming a depressed helicoid spire, which is obliquely, almost one-half immersed in the first of the succeeding turns. Post-nuclear whorls moderately rounded, marked by strong, decidedly retractive, axial ribs and, on the first four turns, by three spiral cords which equal the ribs in strength; the middle one of these three cords is a little nearer that at the summit than to the one anterior to it. Of the ribs, 16 occur upon all the whorls. The intersections of the ribs and spiral cords form strong, compressed tubercles, the long axes of which coincide with the spiral sculpture. The spaces between the cords and ribs are well rounded, strongly impressed pits. The median cord on the first four whorls is a little stronger than the other two. On the penultimate whorl a slender, spiral cord makes its appearance, between the median and the supraparipheral cord, which on the last turn, immediately behind the aperture, attains a strength equal to that of the spiral cord at the summit. Entire surface of the spire marked by numerous, very fine, incremental lines. Periphery of the last whorl marked by a deep channel across which the axial ribs extend feebly. Base of the last whorl well rounded, marked by four strong spiral keels, which are subequally spaced and grow somewhat weaker successively from the peripheral to the umbilical area. Immediately anterior to the last of these spiral keels there is a single, slender, raised spiral thread. The spaces between the spiral keels are crossed by slender continuations of the axial ribs and very fine lines of growth. Aperture oval; outer lip (fractured); inner lip oblique, strong, slightly reflected upon and adnate to the base, provided with a moderately strong fold at its insertion; parietal wall glazed with a thin callus.

The type, Cat. No. 212033, U.S.N.M., was dredged at United States Bureau of Fisheries station 2932, in 20 fathoms, on sand bottom, bottom temperature 58°, off San Diego, California. It has 6 post-nuclear whorls and measures: Length, 3.2 mm.; diameter, 1.3 mm.

The present species is the first one that we have seen from the west coast of America having three nodulose, spiral cords between the sutures. This should be the first species in the key.

ODOSTOMIA (CHRYSTALLIDA) DICELLA, new species.

Plate 36, fig. 1.

Shell small, elongate-ovate, somewhat translucent, bluish-white. Nuclear whorls small, very obliquely immersed in the first of the succeeding turns. Post-nuclear whorls well rounded, marked by four spiral cords between the sutures, the three posterior of which are

nodulose on the early whorls; the fourth, or suprasutural one being smooth. On the last whorl the nodules are obsolete. Of these cords, the one at the summit is the weakest and the second below it the strongest. The spaces between the spiral keels are about half as wide as the keels and rather shallow. In addition to the spiral sculpture the whorls are marked by slender, almost axial riblets, which render the three posterior keels on the early whorls nodulose at their intersections. Of these riblets, about 18 occur upon the second and 22 upon the third whorl. On the fourth, which is the penultimate, the grooves between the keels are crossed by slender axial threads. Sutures strongly constricted. Periphery of the last whorl marked by a narrow, deep sulcus. Base moderately long, well rounded, marked by five spiral cords which grow successively weaker between the periphery and the umbilical area. Grooves between the sutural cords equal, crossed by numerous, slender, axial threads, which cause the spaces between the threads and cords to appear as minute pits. Aperture moderately large, somewhat effuse anteriorly; posterior angle acute; outer lip thin, showing the external sculpture within; inner lip moderately long, strong, somewhat curved, and reflected over and adnate to the base, provided with a slender fold at its insertion; parietal wall covered with a thin callus.

The type (Cat. No. 211 62, U.S.N.M.), which was collected by Mr. Kelsey at San Diego, California, has 5 post-nuclear whorls and measures: Length, 3 mm.; diameter, 1.5 mm.

This species follows *Odostomia* (*Chrysallida*) *helga* in the key.

ODOSTOMIA (CHRYSTALLIDA) *THELIA*, new species.

Plate 36, fig. 3.

Shell small, elongate-ovate, bluish-white, semitranslucent. Nuclear whorls obliquely immersed in the first of the succeeding turns, above which half of the tilted edge of the last volution only projects. Post-nuclear whorls well rounded, feebly shouldered at the summit, marked by very slender, poorly developed, decidedly retractive, axial ribs, of which about 30 occur between the sutures upon the last two volutions. In addition to these axial ribs, the whorls are marked by low, feebly rounded, rather broad spiral cords, of which 6 occur between the sutures, on the second, and 7 upon the third and fourth whorl; the spaces separating the spiral cords are narrow, impressed lines. The intersections of the axial ribs and spiral cords form weak tubercles, while the spaces inclosed between them are roundish pits. Sutures moderately constricted. Periphery of the last whorl well rounded, marked by a cord equalling the one posterior to it in width, and separated from that by a line as wide as those on the spire. Base moderately prolonged, well rounded, marked with 12 low, rounded spiral cords, which decrease successively in width from the periphery,

anteriorly; the spaces separating these cords are also narrow impressed lines. Aperture moderately large, oval; posterior angle acute; outer lip strongly curved showing the external sculpture within; inner lip slightly curved, oblique, reflected over and adnate to the base, provided with a slender fold at its insertion. Parietal wall covered by a thin callus.

The type (Cat. No. 249903, U.S.N.M.) was dredged in 6 fathoms at the north end of Coronado Island, San Diego, by Doctor Baker. It has 5 post nuclear whorls and measures: Length, 2 mm.; diameter, 1 mm.

This species follows *Odostomia (Chrysallida) dicella* in the key.

ODOSTOMIA (MENESTHO) GLORIOSA, new species.

Plate 36, fig. 2, 2a.

Shell moderately large, very elongate-ovate, with very regular, conic spire, bluish-white. Nuclear whorls small, obliquely immersed in the first of the succeeding turns, above which a portion of the last two volutions only project. Post-nuclear whorls flattened, marked by three equal and equally spaced, strong, spiral keels, of which one is at the summit and another about as far above the periphery as the space which separates it from the median keel. The spaces between the spiral keels are deep, rounded grooves, almost as wide as the keels and crossed by numerous, slender, axial threads. Sutures deeply channeled; channels a little more profound than those between the keels. Periphery of the last whorl marked by a sulcus. Base short, well rounded, and marked by four subequal and subequally spaced, spiral cords, the spaces between which appear as rather broad sulci and are crossed by slender axial threads. Aperture small, very oblique, ovate; posterior angle obtuse; outer lip thin, showing the external sculpture within; inner lip short, curved, slightly revolute, provided with a strong fold at its insertion; parietal wall glazed with a thin callus.

The type of this species (Cat. No. 211561, U.S.N.M.) was collected by Mr. F. W. Kelsey at San Diego, California; it has 6 post-nuclear whorls and measures: Length, 2.8 mm.; diameter, 1.3 mm. Another specimen, in Mr. Kelsey's collection, is a little larger than the type, measuring: Length, 3.1 mm.; diameter, 1.4 mm. This was collected by Mr. Henry Hemphill at San Hipolito Point, Lower California.

This species follows *Odostomia (Menestho) recta* in the key.

ODOSTOMIA (MENESTHO) EXCISA, new species.

Plate 36, fig. 8.

Shell moderately large, elongate-ovate, yellowish-white. Nuclear whorls decollated. Post-nuclear whorls well rounded, appressed at the summit, marked by four equally strong but not equally spaced, incised, spiral lines between the sutures. The fourth of these is

immediately above the periphery, while the first is as far below the summit as the third is posterior to the fourth. The second line divides the space between the first and third into equal halves, which are about one and a half times as wide as the spaces included between the third and fourth incised spiral. In addition to the spiral sculpture the whorls are crossed by numerous, fine, decidedly retractive, incremental lines. Periphery of the last whorl somewhat inflated, well rounded. Base moderately long and moderately rounded, crossed by 8 strongly incised, equal, spiral lines, which are a little stronger than those occurring on the spire. These lines become exceedingly closely spaced between the periphery and the umbilical area. The axial sculpture on the base is of the same character and strength as that appearing on the spire. All of the incised, spiral lines on base and spire are crossed by very slender, axial threads, which lend these channels a somewhat pitted appearance. Sutures well impressed. Aperture moderately large, oval, effuse anteriorly; posterior angle acute; outer lip thin, showing the external sculpture within; inner lip oblique, moderately long, somewhat reflected, and reenforced for the greater part of its length by the attenuated base, provided with an oblique fold at its insertion; parietal wall glazed with a thin callus.

The type (Cat. No. 194518, U.S.N.M.) comes from Catalina Island, California. It has lost the nucleus and probably a portion of the first post-nuclear turn; the five remaining measure: Length, 3.9 mm.; diameter, 1.9 mm.

This species follows *Odostomia* (*Menestho*) *callipyrga* in the key.

ODOSTOMIA (EVALEA) YOUNGI Dall and Bartsch.

Plate 37, fig. 6.

Odostomia (*Evalea*) *youngi* DALL and BARTSCH, Dep. Mines, Geol. Surv., Canada, 1910, pp. 16-17, pl. 2, fig. 1.

Shell, elongate-conic, umbilicated, milk-white. Nuclear whorls small, obliquely immersed in the first of the post-nuclear turns, above which only the tilted edge of the last volution projects. Post-nuclear whorls moderately rounded, with a narrow tabulatedly shouldered summit, marked by equally spaced, rather strong, spiral striations, of which about 32 occur between the summit and the periphery on the penultimate turn. Periphery and base of the last whorl inflated, well rounded, marked with spiral sculpture equal in strength and disposition to that on the spire. Sutures strongly impressed. In addition to the spiral sculpture, the whorls are marked with curved retractive lines of growth. Aperture pear-shaped; posterior angle acute; outer lip thin; inner lip slender, curved, and somewhat revolute, provided with a strong oblique fold a little anterior to its insertion; parietal wall glazed with a thick callus.

Two specimens—one of which is in the Geological Survey Museum, Ottawa, and the other in the United States National Museum, Cat. No. 211542—were dredged in 18 to 20 fathoms in Ship Channel, Barkley Sound, Vancouver Island, British Columbia. One of these specimens has 7 post-nuclear whorls and measures: Length, 6.5 mm.; diameter, 2.4 mm.

Named for Mr. C. H. Young, of the Geological Survey, Ottawa, at the request of Mr. John C. Macoun.

This species follows *Odostomia (Evalea) killisnooensis* in the key.

ODOSTOMIA (EVALEA) THEA, new species.

Plate 37, fig. 7; plate 38, fig. 13.

Shell moderately large, elongate-ovate, yellowish-white. Nuclear whorls small, deeply, obliquely immersed in the first of the succeeding turns, above which only the tilted edge of the last volution projects. Post-nuclear whorls moderately rounded, rather high between the sutures, slightly shouldered at the summit, crossed by numerous fine, decidedly retractive lines of growth. The spiral sculpture is strong on the early whorls, becoming gradually finer with the growth of the shell. The first two turns are divided into five, almost equal areas by four equally, strongly incised, spiral lines, between the sutures. On the third whorl the spiral lines are increased to about a dozen and are considerably less strong; on the succeeding turn they are probably almost tripled and still weaker; while on the penultimate volution the sculpture consists of somewhat wavy, closely spaced, spiral striations. Periphery of the last whorl obscurely angulated, somewhat inflated; base moderately long, curving gently to the anterior portion of the shell, marked like the body whorl with fine, spiral lines. Sutures somewhat constricted. Aperture moderately large, oval; posterior angle obtuse; outer lip thin; inner lip rather long, slightly curved, and somewhat revolute, provided with a strong fold at its insertion; parietal wall glazed with a thin callus.

The type (Cat. No. 211556, U.S.N.M.) comes from San Pedro, California. It has 6 post-nuclear whorls and measures: Length, 4.7 mm.; diameter, 2.2 mm.

This species follows *Odostomia (Evalea) youngi* in the key.

ODOSTOMIA (EVALEA) CALLIOPE, new species.

Plate 38, figs. 10, 10a.

Shell elongate-ovate, turreted, narrowly umbilicated, creamy-white. Nuclear whorls small, obliquely immersed in the first of the succeeding turns, above which only the tilted edge of the last volution projects. Post-nuclear whorls rather high between the sutures, decidedly, tabulatedly shouldered at the summit, almost flattened below the shoulder, the spaces between the shoulders and the sutures

appearing as cylindrical elements. The whorls are marked by rather strong, incremental lines and by numerous strong, wavy, incised, spiral striations. Periphery and the moderately long base of the last whorl well rounded, marked like the spire. Aperture large, oval; posterior angle decidedly obtuse; outer lip thin; inner lip moderately strong, oblique, somewhat sinuous, slightly reflected, and provided with a fold some little distance anterior to its insertion; parietal wall glazed with a moderately thick callus.

The type (Cat. No. 211557, U.S.N.M.) was dredged at United States Bureau of Fisheries station 4322, in 110 to 199 fathoms, off Point La Jolla, California. It has 5 post-nuclear whorls and measures: Length, 4.2 mm.; diameter, 2 mm.

The present species is nearest related to *Odostomia (Evalea) profundicola* Dall and Bartsch, from which it differs chiefly in being much stouter and proportionately shorter, in having more strongly tabulated shoulders, and in having the surface very strongly, spirally striated, the spiral sculpture in *Odostomia (Evalea) profundicola* being exceedingly fine.

This species follows *Odostomia (Evalea) thea* in the key.

ODOSTOMIA (EVALEA) CALCARELLA, new species.

Plate 37, fig. 4.

Shell very broadly elongate-conic, creamy-white. Nuclear whorls obliquely immersed in the first of the succeeding turns. Post-nuclear whorls moderately well rounded, slightly shouldered at the summit, marked by decidedly retractive lines of growth and numerous, strong, incised, spiral lines. Suture constricted. Periphery of the last whorl subangulated and inflated. Base short, narrowly umbilicated, marked like the spire. Aperture large, somewhat effuse anteriorly; outer lip thin, strongly curved; inner lip slender, decidedly curved and reflected, provided with a moderately strong fold a little anterior to its insertion.

The type (Cat. No. 211587, U.S.N.M.) was dredged by the United States Bureau of Fisheries steamer *Albatross*, at station 2901, in 48 fathoms, off Santa Rosa Island, California. It has 5 post-nuclear whorls and measures: Length, 3.3 mm.; diameter, 1.8 mm.

This species follows *Odostomia (Evalea) calliope* in the key.

ODOSTOMIA (EVALEA) SPREADBOROUGHII Dall and Bartsch.

Plate 38, fig. 8.

Odostomia (Evalea) spreadboroughii DALL and BARTSCH, Dep. Mines, Geol. Surv., Canada, 1910, p. 17, pl. 2, fig. 2.

Shell, elongate-ovate, somewhat translucent, bluish-white. Nuclear whorls small, deeply, very obliquely immersed within the first of the succeeding turns. Post-nuclear whorls inflated, flattened in the

middle, rounded strongly at the summit and the suture, marked by decidedly sinuous, exceedingly fine lines of growth and fine spiral striations; the latter are less strongly developed on the posterior two-thirds between the sutures than on the anterior third and on the base. Sutures strongly constricted. Periphery of the last whorl and base inflated, well rounded, the latter deeply and strongly umbilicated. Aperture oval; posterior angle acute; outer lip thin, showing the external sculpture within; inner lip very slender, strongly curved and slightly revolute, provided with a very faint, oblique fold a little anterior to its insertion; parietal wall glazed with a thin callus.

There are three specimens of this species, two of which are in the Geological Survey Museum collection at Ottawa, and one (Cat. No. 211541) is in the United States National Museum. All three were dredged in 18 to 28 fathoms at Ship Channel, Barkley Sound, Vancouver Island, British Columbia. The specimen figured has 5 post-nuclear whorls, and measures: Length, 3.8 mm.; diameter, 1.9 mm.

This species follows *Odostomia (Evalea) esilda* in the key.

ODOSTOMIA (EVALEA) VANCOUVERENSIS Dall and Bartsch.

Plate 37, fig. 1.

Odostomia (Evalea) vancouverensis DALL and BARTSCH, Dep. Mines, Geol. Surv., Canada, 1910, pp. 18-19, pl. 2, fig. 7.

Shell, elongate-ovate, very narrowly umbilicated, turreted, yellowish-white. Nuclear whorls small, obliquely immersed in the first of the succeeding turns, above which only half of the last volution projects and extends beyond the outline of the spire. Post-nuclear whorls broadly, tabulatedly shouldered at the summit, moderately rounded, marked by almost vertical lines of growth and numerous exceedingly fine spiral striations. Sutures rendered very conspicuous by the tabulated shoulder. Periphery of the last whorl well rounded, base moderately long, well rounded, marked like the spire. Aperture large, elongate-ovate, somewhat effuse anteriorly; posterior angle decidedly obtuse; outer lip thin; inner lip slender, oblique, and somewhat revolute, provided with an oblique fold a little anterior to its insertion; parietal wall glazed with a thin callus.

Specimens of this species were dredged in 18 to 28 fathoms at Ship Channel, Barkley Sound, Vancouver Island, British Columbia, part of which are in the collection of the Geological Survey, Ottawa, and others in the United States National Museum, Cat. No. 211539. The specimen figured has 5 post-nuclear whorls, and measures: Length, 4.7 mm.; diameter, 2.2 mm.

The strongly tabulated summit of the whorls separates this species from all the known *Evaleas* of the Oregonian faunal area.

This species follows *Odostomia (Evalea) spreadboroughi* in the key.

ODOSTOMIA (EVALEA) QUADRÆ Dall and Bartsch.

Plate 37, fig. 3.

Odostomia (Evalea) quadræ DALL and BARTSCH, Dep. Mines, Geol. Surv., Canada, 1910, pp. 17-18, pl. 2, fig. 6.

Shell, elongate-ovate, milk-white, umbilicated. Nuclear whorls deeply, obliquely immersed in the first of the post-nuclear turns, above which only the tilted edge of the last volution projects. Post-nuclear whorls moderately rounded, moderately shouldered at the summit, marked by faint, slightly retractive lines of growth, and numerous, exceedingly fine, microscopic, spiral striations. In addition to this sculpture, the last whorl shows many weak malleations. Periphery of the last whorl and the moderately long base somewhat inflated, well rounded, marked like the spire. Aperture large, oval; posterior angle acute; outer lip thin; inner lip very oblique, slightly curved and strongly revolute, extending partly over the umbilicus, provided with a moderately strong fold a little anterior to its insertion; parietal wall glazed with a thin callus.

Fifty-three specimens of this species were dredged in 18 to 28 fathoms at Ship Channel, Barkley Sound, Vancouver Island, British Columbia. Part of these are in the Geological Survey Museum collection at Ottawa; the remainder are in the United States National Museum collection, Cat. No. 211540. The figured specimen has 6 post-nuclear whorls, and measures: Length, 6.2 mm.; diameter, 3.2 mm.

This species follows *Odostomia (Evalea) kadiakensis* in the key.

ODOSTOMIA (EVALEA) CALLIMENE, new species.

Plate 38, fig. 2, 2a.

Shell elongate-ovate, milk-white. Nuclear whorls small, obliquely immersed in the first of the succeeding turns, above which only half of the last volution projects, the projecting portion extending considerably beyond the outline of the post-nuclear spire. Post-nuclear whorls slightly rounded, somewhat constricted at the summit, marked by almost vertical lines of growth and very regular, closely spaced, wavy, spiral striations; of the latter about 25 occur between the sutures and the third whorl. Periphery of the last whorl decidedly inflated; strongly rounded; base moderately long, well rounded, with a narrow umbilicus, marked like the spire. Sutures moderately impressed. Aperture large, slightly effuse anteriorly; posterior angle acute; outer lip very thin; inner lip quite long, decidedly flexuose and somewhat reflected, provided with a strong fold opposite the umbilical chink; parietal wall glazed with a thin callus.

The type (Cat. No. 211555, U.S.N.M.) was obtained by Mrs. Oldroyd in deep water at San Pedro, California. It has 5 post-nuclear whorls and measures: Length, 3.1 mm.; diameter, 1.6 mm.

This species follows *Odostomia (Evalea) quadræ* in the key.

ODOSTOMIA (EVALEA) CYPRIA Dall and Bartsch.

Plate 37, fig. 9.

Shell of medium size, narrowly elongate-ovate, umbilicated, yellowish-white. (Nuclear whorls decollated.) Post-nuclear whorls rather high between the sutures, moderately rounded, very feebly shouldered at the summit, marked by fine lines of growth and numerous exceedingly fine, closely-spaced, spiral striations. Sutures very slightly constricted. Periphery of the last whorl very rounded. Base moderately long, well rounded, narrowly umbilicated. Aperture broadly oval, effuse anteriorly; posterior angle obtuse; outer lip thin; inner lip very oblique, slightly curved and revolute, not appressed to the base, provided with a very deep-seated feeble fold at its insertion; parietal wall covered with a thick callus, which renders the peritreme complete.

The unique type, which was dredged by Mr. Spreadborough at Skidegate, is in the collection of the Geological Survey of Canada. It has 5 post-nuclear whorls and measures: Length, 4 mm.; diameter, 2 mm.

This species follows *Odostomia (Evalea) herilda* in the key.

ODOSTOMIA (EVALEA) HYPATIA Dall and Bartsch.

Plate 37, fig. 5.

Shell large, elongate-ovate, strongly umbilicated, yellowish-white. Nuclear whorls deeply immersed in the first of the succeeding turns, above which the tilted edge of the last volution only projects. Post-nuclear whorls well rounded, feebly shouldered at the summit, marked by fine incremental lines, and numerous exceedingly fine, closely spaced, spiral striations. Sutures moderately constricted. Periphery of the last whorl inflated, well rounded. Base moderately long, well rounded, openly umbilicated. Aperture oval, effuse anteriorly; posterior angle obtuse; outer lip thin; inner lip very oblique, slender, curved, and decidedly reflected, but not appressed to the base, provided with a moderately strong fold a little anterior to its insertion; parietal wall glazed with a thin callus.

The unique type of this species, which is in the collection of the Geological Survey of Canada, was dredged by Mr. Spreadborough at Skidegate. It has 6 post-nuclear whorls and measures: Length, 5.2 mm.; diameter, 2.8 mm.

This species follows *Odostomia (Evalea) cypria* in the key.

ODOSTOMIA (EVALEA) BARKLEYENSIS Dall and Bartsch.

Plate 38, fig. 9.

Odostomia (Evalea) barkleyensis DALL and BARTSCH, Dep. Mines, Geol. Surv., Canada, 1910, p. 19, pl. 2, fig. 8.

Shell, small, regularly conic, bluish-white. Nuclear whorls deeply, obliquely immersed in the first of the succeeding turns, above which only the tilted edge of the last volution projects. Post-nuclear whorls slightly rounded, marked by fine retractive lines of growth and numerous fine, spiral striations. Sutures strongly impressed. Periphery of the last whorl subangulated. Base rather short, sloping from the subangulated periphery to its anterior margin, with a tumid area bounding the narrow umbilicus, marked like the spire. Aperture oval; posterior angle acute; outer lip thin; inner lip decidedly curved and reflected, provided with a strong oblique fold at its insertion; parietal wall glazed with a moderately thick callus.

Specimens of this species were dredged in 18 to 28 fathoms in Barkley Sound, Vancouver Island, British Columbia. Part of them are in the Geological Survey Museum collection at Ottawa, and others in the United States National Museum, Cat. No. 211543. The specimen figured has $5\frac{1}{2}$ post-nuclear whorls, and measures: Length, 3.1 mm.; diameter, 1.4 mm.

This species follows *Odostomia (Evalea) io* in the key.

ODOSTOMIA (EVALEA) COOKEANA Bartsch.

Plate 37, fig. 8.

Odostomia (Evalea) cookeana, BARTSCH, Nautilus, vol. 23, 1910, p. 138, pl. 11, fig. 4.

Shell elongate-ovate, very narrowly umbilicated, yellowish-white. Nuclear whorls very obliquely immersed in the first of the succeeding turns. Post-nuclear whorls very high between the sutures where they are very moderately rounded and marked by rather strong incremental lines and very numerous fine spiral striations. Periphery and base of the last whorl somewhat inflated, the latter strongly rounded and marked like the spire. Aperture large, oval; posterior angle acute; outer lip thin; inner lip decidedly oblique, quite strongly curved in the middle and somewhat reflected, provided with an oblique fold, at its insertion, which is strong within and tapers to a vanishing point at the free edge of the columella; parietal wall glazed with a thin callus.

Two specimens of this species were collected by Doctor Baker at Ellamar, Alaska. One of these, an immature specimen, furnished our description of the nucleus, the other, Cat. No. 208427, U.S.N.M., gave the adult characters. The adult specimen has its nucleus badly eroded. The four remaining whorls measure: Length, 3.2 mm.;

diameter, 2 mm. The young individual which is in Doctor Baker's collection has $3\frac{1}{2}$ whorls and measures: Length, 2.3 mm.; diameter, 1.4 mm.

Named for Miss J. M. Cooke, of San Diego, at the request of Doctor Baker. This species follows *Odostomia (Evalea) pratoma* in the key.

ODOSTOMIA (EVALEA) BALDRIDGEÆ, new species.

Plate 38, figs. 1, 1a.

Shell very elongate-conic, yellowish-white. Nuclear whorls small, immersed in the first of the succeeding turns, above which only half of the last volution projects. Post-nuclear whorls high between the sutures, appressed at the summit, slightly rounded, marked by feeble lines of growth, and many sub-equal and subequally spaced, strongly incised, spiral lines. About 25 of these occur between the sutures of the fourth whorl and about 30 between the summit and the periphery on the penultimate turn. Sutures strongly impressed. Periphery of the last whorl somewhat angulated. Base well rounded, moderately long, marked like the spire. Aperture elongate-oval, slightly effuse anteriorly; posterior angle acute; outer lip decidedly sinuous, bent back at the posterior angle to almost form a notch, thin; inner lip moderately long, oblique, slightly curved and slightly revolute, provided with a strong fold at its insertion; parietal wall glazed with a thin callus.

The unique type (Cat. No. 211558, U.S.N.M.) was collected by Mrs. Elizabeth E. Johnston at San Pedro, California. It has 7 post-nuclear whorls and measures: Length, 5.6 mm.; diameter, 2 mm.

It is named for Mrs. B. L. Baldrige at the request of Miss E. E. Johnston.

This species follows *Odostomia (Evalea) socorroensis* in the key.

ODOSTOMIA (EVALEA) SKIDGATENSIS, new species.

Plate 38, fig. 7.

Shell elongate-conic, yellowish-white. Nuclear whorls completely immersed in the first of the succeeding turns, above which only half of the last turn projects. Post-nuclear whorls very slightly rounded, feebly shouldered at the summit, marked by incised spiral lines, which are much stronger on the first two volutions than on the remaining. Of these lines, 10 appear upon the second turn. On the last, they are reduced to exceedingly fine striations. Sutures moderately constricted. Periphery of the last whorl decidedly inflated and feebly angulated. Base somewhat prolonged, moderately rounded, marked by fine, closely spaced, spiral striations. Aperture large, oval; posterior angle acute; outer lip thin; inner lip strong, moderately curved, and partly reflected over the base to which it is appressed, provided with a strong fold at its insertion.

Seven specimens of this species were dredged at Skidegate; three at station 5, which may be considered cotypes; two at station 4, and two at station 2. Of these, two of the cotypes are in the collection of the Geological Survey of Canada, and one in the United States National Museum, Cat. No. 220116; of the other two lots one from each station is in the collection of the Geological Survey of Canada and the United States National Museum. The cotype figured has 5 post-nuclear whorls and measures: Length, 3.4 mm.; diameter, 1.6 mm.

This species follows *Odostomia (Evalea) hagemeisteri* in the key.

ODOSTOMIA (EVALEA) PALMERI, new species.

Plate 38, figs. 4, 4a.

Shell very small, elongate-ovate, semitranslucent, bluish-white. Nuclear whorls deeply, obliquely immersed in the first of the succeeding turns, above which only the tilted edge of the last volution projects. Post-nuclear whorls well rounded, feebly shouldered at the summit, marked by exceedingly fine, almost vertical lines of growth and microscopic spiral striations. Sutures strongly impressed. Periphery and the rather long base of the last whorl well rounded, marked like the spire. Aperture very large, regularly ovate; posterior angle obtuse; outer lip thin; inner lip very oblique, almost straight, very slender and very slightly revolute; parietal wall glazed with a thin callus.

Two specimens of this species (Cat. No. 198903, U.S.N.M.) were collected by Dr. Edward Palmer at the head of the Gulf of California. The type has 4 post-nuclear whorls and measures: Length, 1.4 mm.; diameter, 0.8 mm.

This species is nearest to *Odostomia (Evalea) tenuis* Carpenter from Mazatlan, but differs from it in not being umbilicated and in having the whorls more rounded and not overhanging.

This species follows *Odostomia (Evalea) granadensis* in the key.

ODOSTOMIA (EVALEA) CASSANDRA, new species.

Plate 38, fig. 5.

Shell small, ovate, very thin, semitransparent, light yellow. Nuclear whorls deeply immersed in the first of the succeeding turns. Post-nuclear whorls very strongly, tabulatedly shouldered at the summit, moderately rounded, marked by fine incremental lines, and numerous exceedingly closely spaced, very fine, spiral striations. Sutures strongly constricted. Periphery of the last whorl well-rounded. Base rather long, well-rounded. Aperture very large, broadly oval; posterior angle decidedly obtuse; outer lip very thin; inner lip very slender, very oblique, somewhat sinuous, strongly curved, and slightly reflected over the base, but not appressed to it, provided with a weak fold some little distance anterior to its insertion.

Two specimens, cotypes, of this species were dredged at Skidegate. One of these has 4 post-nuclear whorls and measures: Length, 2.5 mm.; diameter, 1.3 mm. One is in the collection of the Geological Survey of Canada; the other is Cat. No. 220120 in the United States National Museum.

This species follows *Odostomia (Evalea) palmeri* in the key.

ODOSTOMIA (AMAURO) SUBGLOBOSA, new species.

Plate 37, fig. 2.

Shell moderately large, subglobose, milk-white, very narrowly umbilicated. Nuclear whorls small, deeply, obliquely immersed in the first of the succeeding turns. Post-nuclear whorls well-rounded, narrowly, tabulatedly shouldered at the summit; surface somewhat rough, marked by weak lines of growth and spiral striations; periphery of the last whorl strongly inflated; base short, inflated, marked like the spire. Aperture large, ear-shaped; posterior angle obtuse; outer lip thin at the edge, thick within; inner lip short, strong, twisted, and somewhat revolute, provided with a strong fold a little anterior to its insertion; parietal wall glazed with a moderately thick callus.

Two specimens of this species were collected by Mr. F. W. Kelsey at San Diego, California. One of these, the type, is in the United States National Museum, Cat. No. 211560. It has 6 post-nuclear whorls and measures: Length, 6 mm.; diameter, 4.1 mm. The other is in Mr. Kelsey's collection.

This species follows *Odostomia (Amauro) beringi* in the key.

ODOSTOMIA (AMAURO) HELENA, new species.

Plate 38, fig. 10.

Shell moderately large, yellowish-white, very elongate-ovate. Nuclear whorls small, very obliquely immersed in the first of the succeeding turns, above which the tilted edge of the last volution only projects. Post-nuclear whorls subtabulatedly shouldered at the summit, well rounded, apparently marked by incremental lines only. Sutures strongly constricted. Periphery of the last whorl somewhat inflated, well rounded. Base short, well rounded, broadly umbilicated, marked like the spire. Aperture moderately large, ovate; posterior angle obtuse; outer lip evenly curved; inner lip sinuous, reflected over, but not adnate to the base, provided with a strong oblique fold, which is about one-third of the distance of the length of the inner lip anterior to the insertion of the inner lip. Parietal wall covered with a thick callus.

The type (Cat. No. 249904, U.S.N.M.) was collected by Mrs. Baldridge at San Pedro, California. It has 6 post-nuclear whorls, and measures: Length, 5 mm.; diameter, 2.7 mm. The position of the columellar fold will distinguish this species at a glance from all the other California shells.

This species follows *Odostomia (Amauro) satura* in the key.

ODOSTOMIA (AMAURA) GRIPPIANA, new species.

Plate 38, fig. 11.

Shell large, umbilicated, yellowish-white. Nuclear whorls decollated. Post-nuclear whorls decidedly, slopingly, tabulatedly shouldered at the summit, otherwise moderately rounded; marked by fine incremental lines and numerous, equal and equally spaced, slender, wavy, spiral threads, of which 6 occur upon the shoulder, and about 40 between the shoulder and the suture. Periphery and the moderately long base of the last whorl well rounded, marked like the spire. Aperture moderately large, ear-shaped; posterior angle obtuse; inner lip moderately long, stout, curved, somewhat reflected, provided with a strong fold a little anterior to its insertion; parietal wall glazed with a thin callus.

The type (Cat. No. 211559, U.S.N.M.) was collected by Mr. Gripp at Nanaimo, British Columbia. It has 6 post-nuclear whorls and measures: Length, 7.5 mm.; diameter, 0.4 mm. The fine spiral lirations differentiate this form from all other umbilicate *Amauras*.

This species follows *Odostomia (Amaura) helena* in the key.

ODOSTOMIA (AMAURA) ELDORANA, new species.

Plate 38, fig. 12.

Shell elongate, conic, wax-yellow. (Nuclear whorls decollated.) Post-nuclear whorls moderately well rounded, slightly constricted at the sutures, feebly roundly shouldered at the summit, marked with lines of growth and very fine spiral striations. Periphery of the last whorl well rounded. Base slightly protracted, well rounded, very narrowly umbilicated. Aperture elongate ovate; posterior angle acute; outer lip thin at the edge; inner lip very oblique, somewhat sinuous, reflected over and adnate to the base, provided with a moderately strong fold, a little anterior to its insertion; parietal wall closed by a very thin callus.

The type and another individual (Cat. No. 34246, U.S.N.M.) were collected at Kadiak Island, Alaska. The type has the last $4\frac{1}{2}$ whorls remaining, which measure: Length, 9 mm.; diameter, 4 mm.

This species follows *Odostomia (Amaura) krausei* in the key.

ODOSTOMIA (SCALENOSTOMA) BABYLONIA, new species.

Plate 38, fig. 3.

Shell elongate-conic, light yellowish-brown, excepting the umbilical area, the extreme basal portion and the tip, which are white. Nuclear whorls very small. Post-nuclear whorls flattened, separated by a scarcely impressed suture. On the last three turns the whorls are marked at the periphery by an exceedingly strong, acute, spiral keel, which is slightly bent downward. Base of the last whorl short, well rounded. Entire surface of spire and base smooth, except for exceedingly fine, incremental lines. Aperture oval; posterior angle acute; outer lip rendered }-shaped by the spiral keel; inner lip slender, evenly curved, very slightly revolute; parietal wall glazed with a thin callus.

Two specimens of this species (Cat. No. 127542, U.S.N.M.) come from San Hipolito Point, Lower California. The type has 10 post-nuclear whorls and measures: Length, 3 mm.; diameter, 1.2 mm.

The present species differs from *Odostomia* (*Scalenostoma*) *dotella* Dall and Bartsch in being much larger, much more acicular, and in being brown instead of translucent.

ODOSTOMIA (HEIDA) KELSEYI, new species.

Plate 38, figs. 6, 6a.

Shell small, ovate, bluish-white. Nuclear whorls small, obliquely immersed in the first of the succeeding turns, above which only the tilted edge of the last volution projects. Post-nuclear whorls moderately rounded, narrowly shouldered at the summit, marked only by moderately retractive lines of growth and numerous exceedingly fine, spiral striations. Sutures subchanneled. Periphery of the last whorl somewhat inflated, well rounded. Base moderately long, sloping evenly from the periphery to the anterior extremity, the area about the umbilicus having a pinched-in effect, and is surrounded by a somewhat tumid area. Aperture large, broadly oval, somewhat flaring at the anterior lateral angle; posterior angle acute; outer lip thin; inner lip decidedly curved and slightly revolute; parietal wall covered with a thick callus which joins the callus of the columella to the posterior angle of the aperture, rendering the peritreme complete. No fold is visible on the columella. Operculum horny, thin pauci-spiral, concavo-convex, the convex side being the outer.

Two specimens of this species were collected at San Diego, California. One of these, the type (Cat. No. 211544, U.S.N.M.), has 5 post-nuclear whorls and measures: Length, 2.7 mm.; diameter, 1.5 mm. The other specimen is in Mr. Kelsey's collection.

EXPLANATION OF PLATES.

PLATE 35.

Fig. 1. *Turbonilla* (*Strioturbonilla*) *encella*; type; 4.5 mm.; p. 265.

The fine spiral striations have been omitted in this figure.

1a. Nucleus of the same much enlarged.

2. *Turbonilla* (*Strioturbonilla*) *dracona*; type; 6.9 mm.; p. 266.

The fine spiral striations have been omitted in this figure.

2a. Nucleus of the same much enlarged.

3. *Turbonilla* (*Strioturbonilla*) *cookeana*; type; 6.9 mm.; p. 266.

4. *Turbonilla* (*Chemnitzia*) *clarinda*; type; 4.7 mm.; p. 264.

4a. Nucleus of the same much enlarged.

5. *Turbonilla* (*Pyrgolampros*) *pesa*; type; 6 mm.; p. 269.

6. *Turbonilla* (*Pyrgolampros*) *rinella*; type; 8.5 mm.; p. 270.

7. *Turbonilla* (*Pyrgolampros*) *talma*; type; 9 mm.; p. 267.

8. *Turbonilla* (*Strioturbonilla*) *dinora*; type; 9.2 mm.; p. 264.

The fine spiral striations have been omitted in this figure.

9. *Turbonilla* (*Pyrgolampros*) *gloriosa*; type; 8.3 mm.; p. 268.

10. *Turbonilla* (*Strioturbonilla*) *bakeri*; type; 8 mm.; p. 265.

The fine spiral striations have been omitted in this figure.

10a. Nucleus of the same much enlarged.

11. *Turbonilla* (*Pyrgolampros*) *macouni*; type; 9 mm.; p. 268.

PLATE 36.

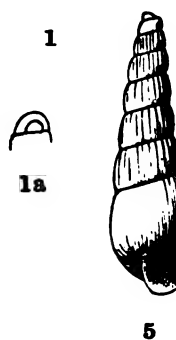
- Fig. 1. *Odostomia (Chrysallida) dicella*; type; 3 mm.; p. 274.
 2. *Odostomia (Menestho) gloriosa*; type; 2.8 mm.; p. 276.
 2a. Nucleus of the same much enlarged.
 3. *Odostomia (Chrysallida) thalia*; type; 2 mm.; p. 275.
 4. *Odostomia (Chrysallida) heterocincta*; type; 3.2 mm.; p. 274.
 4a. Nucleus of the same much enlarged.
 5. *Turbonilla (Mormula) scammonensis*; type; 7.5 mm.; p. 272.
 6. *Odostomia (Besla) excolpa*; type; 2 mm.; p. 273.
 6a. Nucleus of the same much enlarged.
 7. *Turbonilla (Pyrgiscus) callimene*; type; 7.2 mm.; p. 271.
 8. *Odostomia (Menestho) excisa*; type; 3.9 mm.; p. 276.
 9. *Turbonilla (Pyrgiscus) grippi*; type; 11 mm.; p. 270.
 10. *Odostomia (Evalea) calliope*; type; 4.2 mm.; p. 278.
 10a. Nucleus of the same much enlarged.

PLATE 37.

- Fig. 1. *Odostomia (Evalea) vancouverensis*; type; 4.7 mm.; p. 280.
 The fine spiral striations have been omitted in this figure.
 2. *Odostomia (Amaura) subglobosa*; type; 6 mm.; p. 286.
 3. *Odostomia (Evalea) quadra*; type; 6.2 mm.; p. 281.
 The fine spiral striations have been omitted in this figure.
 4. *Odostomia (Evalea) calcarella*; type; 3.3 mm.; p. 279.
 5. *Odostomia (Evalea) hypatia*; type; 5.2 mm.; p. 282.
 The fine spiral striations have been omitted in this figure.
 6. *Odostomia (Evalea) youngi*; type; 6.5 mm.; p. 277.
 7. *Odostomia (Evalea) thea*; type; 4.7 mm.; p. 278.
 8. *Odostomia (Evalea) cookeana*; type; 2.3 mm.; p. 283.
 The fine spiral striations have been omitted in this figure.
 9. *Odostomia (Evalea) cypria*; type; 4 mm.; p. 282.
 The fine spiral striations have been omitted in this figure.

PLATE 38.

- Fig. 1. *Odostomia (Evalea) baldridgei*; type; 5.6 mm.; p. 284.
 1a. Nucleus of the same much enlarged.
 2. *Odostomia (Evalea) callimene*; type; 3.1 mm.; p. 281.
 The fine spiral striations have been omitted in this figure.
 2a. Nucleus of the same much enlarged.
 3. *Odostomia (Scalenostoma) babylonia*; type; 3 mm.; p. 287.
 4. *Odostomia (Evalea) palmeri*; type; 1.4 mm.; p. 285.
 The fine spiral striations have been omitted in this figure.
 4a. Nucleus of the same much enlarged.
 5. *Odostomia (Evalea) cassandra*; type; 2.5 mm.; p. 285.
 The fine spiral striations have been omitted in this figure.
 6. *Odostomia (Heida) kelseyi*; type; 2.7 mm.; p. 288.
 6a. Nucleus of the same much enlarged.
 7. *Odostomia (Evalea) skidegatensis*; type; 3.4 mm.; p. 284.
 8. *Odostomia (Evalea) spreadboroughi*; type; 3.8 mm.; p. 279.
 9. *Odostomia (Evalea) barkleyensis*; type; 3.1 mm.; p. 283.
 The fine spiral striations have been omitted in this figure.
 10. *Odostomia (Amaura) helena*; type; 5 mm.; p. 286.
 11. *Odostomia (Amaura) grippiana*; type; 7.5 mm.; p. 287.
 12. *Odostomia (Amaura) eldorana*; type; 9 mm.; p. 287.
 13. *Odostomia (Evalea) thea*; nucleus much enlarged; p. 278.



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WEST AMERICAN PYRAMIDELLID MOLLUSKS.

FOR EXPLANATION OF PLATE SEE PAGE 288.



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WEST AMERICAN PYRAMIDELLID MOLLUSKS.

FOR EXPLANATION OF PLATE SEE PAGE 289.

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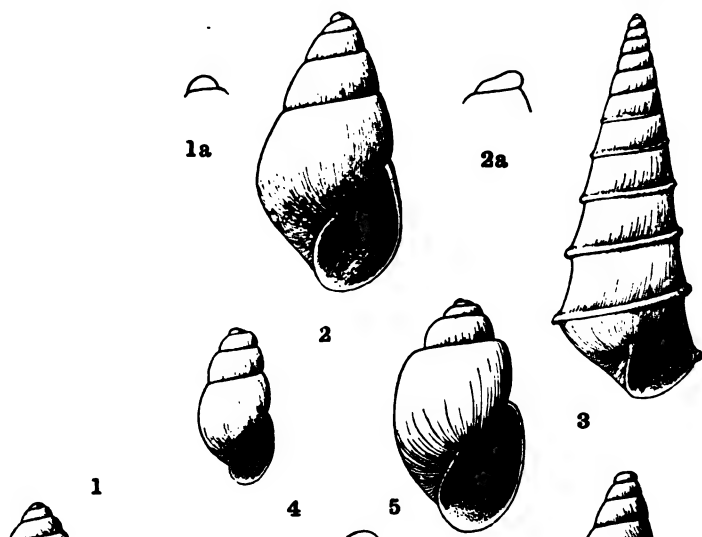
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WEST AMERICAN PYRAMIDELLID MOLLUSKS.

FOR EXPLANATION OF PLATE SEE PAGE 289.



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WEST AMERICAN PYRAMIDELLID MOLLUSKS.

FOR EXPLANATION OF PLATE SEE PAGE 289.

DIAGNOSES OF NEW BARNACLES FROM THE PHILIPPINE
ARCHIPELAGO AND CHINA SEA.

By HENRY A. PILSBRY,

Of the Academy of Natural Sciences of Philadelphia.

The following diagnoses of some new species of Cirripedia from the *Albatross* Philippine cruise are published in advance of the final report on the collection.

ALEPAS NAVIGATOR, new species.

Type-specimen.—Cat. No. 38698, U.S.N.M.

Type-locality.—Nogas Point, Panay, surface, on a large Discomedusa.

Capitulum large, with well calcified, sharply defined scuta, in form of a band along the occludent margin, with a wide diverging ascending branch above. First cirrus with two basal appendages, the other cirri with one, except cirri ii and vi, which have none. Length of capitulum, 30 mm.; greatest width of capitulum, 24; length of peduncle, 25; diameter of peduncle in middle, 7; length of aperture, 16; and length of scutum, 12.

ALEPAS SPECTRUM, new species.

Type-specimen.—Cat. No. 38699, U.S.N.M.

Type-locality.—Nogas Point, Panay, surface, on Discomedusa.

The tunic of the narrow capitulum is excessively thin, without any trace of scuta or other plates, thereby differing from all other known species of *Alepas*.

Length of capitulum, 12 mm.; breadth of capitulum, 6; length of peduncle, 6.

SMILIUM HORRIDUM, new species.

Type-specimen.—Cat. No. 43467, U.S.N.M.

Type-locality.—*Albatross* station 5250, Gulf of Davao, 23 fathoms.

The capitulum is armed with 15 plates, those of the lower whorl projecting horn-like. It is covered with a thick yellowish cuticle in which the outlines of the plates are rather indistinct. The scutum is almost as broad as long, acute above, faintly marked with growth lines. The tergum is triangular, with a process appended on the

occludent side of the summit, which is therefore very obtuse. Carina straight, abruptly bent at the umbo, which is near the apex. Upper lateral plate vertical, long, and narrow. Rostrum small, projecting. Rostral and inframedian latera conic, projecting. Carinal latera long, the upper end projecting. Subcarina long, the apex projecting. Peduncle somewhat shorter than the capitulum, densely covered with small pebble-like scales, those near the base elongated. On the carinal side of the peduncle there are two longitudinal series of larger, more projecting scales, and on one side there is another indistinct series of similar scales.

Length of capitulum, 12 mm.; basal width, 11; length of peduncle, 11.

This species is somewhat related to *S. scorio* Aurivillius, and especially to *S. pollicipedoides* Hoek, but differs from both in the peculiarly obtuse summit, the rows of enlarged scales of the peduncle, and various other characters.

VERRUCA ALBATROSSIANA, new species.

Type-specimen.—Cat. No. 43472, U.S.N.M.

Type-locality.—Albatross station 5447, east of Luzon, 310 fathoms.

A species with the movable valves parallel to the plane of the base, parietal areas of the walls ribbed vertically, basal margin acute, fixed scutum without internal pit or myophore. Movable scutum has five articular ridges counting the crescentic ridge, the rest of the plate being transversely grooved and finely striate longitudinally. Movable tergum having four articular ribs and a stronger diagonal rib. Apices of fixed scutum and tergum contiguous, a little produced. The carina occupies much more of the carino-rostral wall than the rostrum, which is higher and shorter, the apices of both being marginal.

Carino-rostral length between apices, 5.8 mm.; greatest width, 5 mm.; height of fixed tergum, 3.5 mm.

The unusual length of the rostrum and fixed scutum characterize this species.

VERRUCA INTEXTA, new species.

Type-specimen.—Cat. No. 43468, U.S.N.M.

Type-locality.—Albatross station 5259, off northwestern Panay, 312 fathoms. On spines of echinoids with *Megalasma*.

The barnacle is white, solid, with the opercular valves about parallel to the plane of the base; parietal areas of the plates of the wall widely ribbed.

Movable scutum with three articular and three other ribs, the inner face deeply concave; movable tergum with two articular and a strong, diagonal rib, the rest of the plate transversely grooved. Fixed scutum and tergum having rather long, recurved beaks. Carina and rostrum interlocking with numerous teeth, the upper rib and tooth of the carina much longer than the others; beak of carina somewhat

produced. Rostrum having the beak removed some distance from the scutal border, the intervening area radially ribbed, the ribs terminating on the scutal border, where they interlock with those of the scutum; basal edges of the plates of the wall thin and simple. There is no myophore in the fixed scutum.

Greatest carino-rostral length, 7.5 mm.; breadth, 5.4 mm.; height of fixed tergum, 4 mm.

This is a very distinct species, by reason of the shape of the rostrum, in which the summit stands remote from the scutal margin as in *V. neza* and *V. kähleri*.

PACHYLASMA DARWINIANUM, new species.

Type-specimen.—Cat. No. 43465, U.S.N.M.

Type-locality.—Albatross station 5168, Sulu Archipelago, Tawi Tawi group, 80 fathoms.

A species living upon and partly embedded in a hard sponge. Walls solid, base wholly membraneous. The walls form a low cone, with rather large, deeply toothed aperture and are dull red, fading toward the rostrum, which is pale or whitish. The plates are strong, with the parietes smooth except for a fine rugosity; the alæ broad, regularly striate vertically, with oblique, minutely crenulate summits. The scutum is half as wide as long, convex externally, with sculpture of crowded, strongly crinkled growth ridges. Internally there is a low articular ridge and no adductor ridge. The tergum is triangular, without a spur, striate longitudinally on the carinal half, having a low, rounded rib, bounded by depressions on the scutal half. Internally there is a high, short articular ridge, and irregular crests for the depressor muscles, projecting in jagged teeth below the margin.

Greatest diameter of the wall, 18 to 20½ mm.

Strikingly unlike all known species in the sculpture of the scutum and the shape of the tergum.

Pachylasma darwinianum agrees with *P. giganteum* (Philippi), *P. crinoidophilum* Pilsbry, and *P. chinense*, new species, in having conspicuous alæ on the carina, carino-lateral and medio-lateral plates, thereby differing from *P. aurantiacum* Darwin, in which the carino-lateral and medio-lateral plates unite in a simple, linear suture. It differs from all other known species, except *P. crinoidophilum*, by having the base wholly membraneous.

The species of *Pachylasma* now known are very distinct from one another. So far as we know, all are local in distribution, and apparently rare. *P. darwinianum* is known by several specimens cut out of a very dense, hard sponge.

PACHYLASMA CHINENSE, new species.

Type-specimen.—Cat. No. 43471, U.S.N.M.

Type-locality.—Albatross station 5301, latitude 20° 37' N.; longitude 115° 43' E., China Sea, near Hongkong, in 208 fathoms, on the scutum of a living *Scalpellum stearnsii*.

Base calcareous, very thin in the center, thicker and solid toward the edges. Plates of the walls solid, without radii. The plates are white, clouded with pink near the summits of the side-plates and carina, the parietes covered with a very thin yellowish cuticle; opercular plates yellow, pinkish toward their apices. The orifice is large, piriform, toothed; the alæ have arched, minutely serrate upper edges. The sheath is very short, and its lower edge does not overhang. Rostrum and rostral latera separated by inconspicuous linear sutures. Scutum narrow, its greatest width less than half the length, convex outside, with sculpture of smooth, wide, and even growth ridges parted by deep, narrow grooves. The articular ridge is very low, and there is no adductor ridge. The tergum has an extremely short spur and no trace of a longitudinal furrow. There is a high articular ridge, and a series of short teeth in place of the depressor muscle crests.

Greatest diameter of base, 16.5 mm.; height of carina, 13.6 mm.

ACASTA PECTINIPES, new species.

Type-specimen.—Cat. No. 43473, U.S.N.M.

Type-locality.—Albatross station 5276, near Malavatuan Island, off southern Luzon, 18 fathoms.

The barnacle has a deep base, rather weakly striate. The plates of the wall are inflected above, with sculpture of prickly longitudinal threads. Parietes of carina-lateral plate reaching to the base, but extremely narrow, about one-seventh as wide as the rostro-lateral; radii and alæ quite narrow. There are narrow but distinct slits bridged by membrane between the bases of the plates. Scutum regularly sculptured with ridges of growth, the basal margin approaching the occludent margin in length. Tergum very short, with cancellated external sculpture and an extremely short spur, about one-third the width of the basal margin.

Length of walls and base, 8 mm.; carino-rostral diameter, 6.2 mm.

ACASTA IDIOPOMA, new species.

Type-specimen.—Cat. No. 43466, U.S.N.M.

Type-locality.—Albatross station 5254, Gulf of Davao, Mindanao, 21 fathoms.

Walls white. Base deeply bowl-shaped; parietes of carina-lateral plate more than half as wide as rostro-lateral; no apertures between the bases of the wall-plates, which do not converge upward. Scutum strongly striate longitudinally, with a carina marking off the occludent third, which protrudes as a rounded lobe or scutal spur beyond the rest of the lower outline. Tergum having a short triangular spur united with the adjacent border of the plate.

Greatest diameter of the wall, 7.2 mm.

Readily known by the peculiar opercular plates.

A SECOND METEORIC FIND FROM SCOTT COUNTY, KANSAS.

By GEORGE P. MERRILL,

Head Curator of Geology, United States National Museum.

Those conversant with the literature will perhaps remember that in connection with the description of a new meteorite from Modoc, Kansas, some years ago¹ I appended a brief note descriptive of a small stone (135 grams) forwarded by Mr. J. T. Freed, which I relegated provisionally to the Jerome fall of 1898. This was acknowledgedly open to question; there was no question, however, but that it formed no part of the Modoc fall then under consideration, and the occurrence was sufficiently interesting to cause Mr. John T. Freed (son of Mr. J. K. Freed, finder of the Modoc stone) to search for more material. As a result there was received from him in November, 1911, the fragment shown in plate 39, fig. 1, accompanied by the statement that it was found on a quarter section adjoining the one where was found the largest stone of 1906; or, more exactly, about the middle of section 8, township 18, range 33 southwest.

The stone as received is plainly a fragment, roughly wedge-shaped, showing on the lower surface (pl. 39, fig. 1) a fracture so recent in the course of its flight as to be scarcely coated by a fused crust. Other surfaces show the usual crust though obscured by oxidation, the entire stone being of a rusty ochreous brown color. As figured it weighed a scant 1,900 grams. The maximum dimensions were 140 mm. by 130 mm. by 65 mm., thinning out to not more than 10 mm. at the top. The exterior features of the stone, as well as a polished surface, are somewhat similar to those of a recently found but yet undescribed stone from Cullison in Pratt County, and it was thought at first there might be some connection between the two. Further study has, however, convinced me of a lack of identity, both in mineral composition and in structure.

The stone is chondritic, but chondrules of such size as to be evident on a polished surface are rare, of a green color, and firmly embedded in the dense greenish black fragmental ground. The microscopic

¹ Amer. Journ. Sci., vol. 22, May, 1906.

forms are largely fragmental and of the usual olivine-pyroxene type, the pyroxenes being both the monoclinic and orthorhombic varieties. The colorless limpid interstitial mineral occurring in the Modoc stone and there assumed to be a feldspar, is here quite lacking, and nothing that could with certainty be identified as a feldspar was observed. Occasionally polysynthetically twinned forms were met with which, while suggestive of a plagioclase, were, from their lack of limpidity and high polarization colors, assumed to be pyroxene, as usual. The metallic iron and iron sulphide are very evenly and abundantly disseminated throughout the mass of the stone in sizes rarely above one or two millimeters in diameter. Compared with other stones from the same State it is a trifle coarser in texture and of a more greenish color than that of Oakley; more compact and darker in color than that of Ness County. It more closely resembles both in color and texture a stone in the U. S. National Museum collections, from Cullison, Pratt County, in the south-central part of the State, but more than 100 miles distant. Of foreign stones it more closely resembles that of Gilgoi Station, New South Wales, than any others of the National Museum collection.

Should this, as is now apparent, prove to be an independent fall it, together with that of Cullison, above noted, will make 17 to be credited to Kansas. Inasmuch as I designated the find of 1906 as the Modoc meteorite, it will perhaps be best that this second find be known simply as the Scott City stone, the two individuals thus far known weighing respectively 135 and 1,900 grams. From the slightly glazed character of the fracture above alluded to it seems not at all improbable that more material may yet be found.

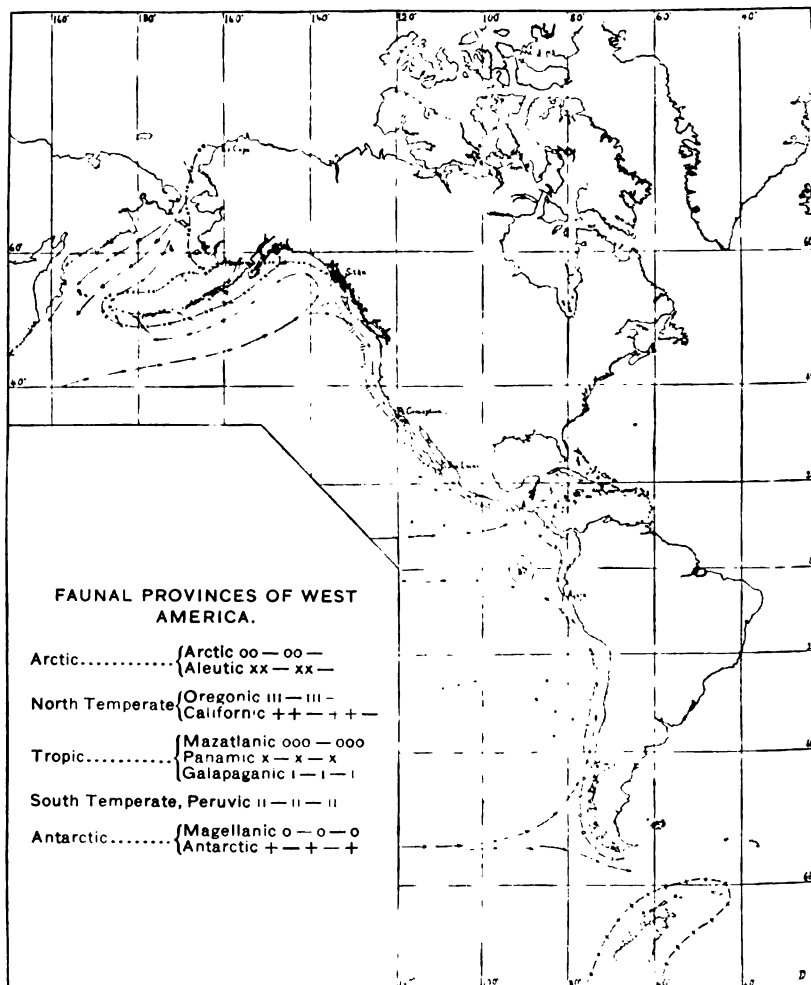
A fragment of this stone, weighing 175 grams only, is in the collection of the National Museum (Cat. No. 429), the main mass still remaining in the possession of Mr. John T. Freed, of Scott City.

1

2

THE SCOTT CITY, KANSAS, METEORITE.

Fig. 1.—Side view, showing recent fracture at bottom. **Fig. 2.**—Opposite side from that shown in figure 1. About half natural size.



FAUNAL PROVINCES OF WEST AMERICA.

FOR EXPLANATION OF MAP SEE PAGE 299.

A ZOOGEOGRAPHIC STUDY BASED ON THE PYRAMIDELLID MOLLUSKS OF THE WEST COAST OF AMERICA.

By PAUL BARTSCH,

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INTRODUCTION.

In this paper I have considered all the available data relating to the distribution of the recent west American species of this family described in Bulletin 68 of the United States National Museum and the additional forms described in the supplemental paper published in these Proceedings, volume 42, page 261, 1912. There have also been included here notes on specimens from the west coast of America, which have been determined for various institutions and individuals since the publication of that monograph. The disposition of this material is mentioned under each reference in the present paper, and I may say here that I wish to extend grateful thanks to all correspondents and institutions mentioned in Bulletin 68 and in the supplemental paper, for it is almost entirely due to their cooperation that the present study has been made possible. I wish also to express my sincere appreciation and thanks to Dr. William H. Dall, honorary curator of the Division of Mollusks, for lending a patient ear to my troubles and giving kindly counsel during the years that I have been at work upon this group.

In the preparation of this manuscript a card was prepared for each species, on which has been noted the number of specimens examined, the locality from which they were obtained, depth in fathoms, bottom temperature, and disposition of material, the last subdivided into two columns, one citing the catalogue number, the other the collection in which the material occurs. It would have been desirable to add the salinity and the physiographic conditions of each station, but unfortunately few data are available on these points. I have noted them wherever they were to be had.

These specific cards fall readily into a series of zoogeographic divisions, which in turn can be easily grouped to correspond with the great provinces outlined by S. P. Woodward, *Manual of Mollusca*, London, 1851-1856, pages 355 and 372 to 377, and later more fully

discussed by Doctor Dall in *Fur Seals and Fur Seal Islands of the North Pacific*, part 3, 1899, page 539, and in the *Proceedings of the United States National Museum*, volume 37, 1909, pages 185 to 191.

I would however, on the basis of the present study, suggest a slight rearrangement of the subdivisions (faunal areas) which the larger provinces have been held to contain in the past, namely, I would retain five primary provinces, using for them the terms ARCTIC, NORTH TEMPERATE, TROPIC, SOUTH TEMPERATE, and ANTARCTIC.

In the first, the ARCTIC, I would include the ALECTIC in the restricted sense and the ALEUTIC of the present paper. These two correspond to the ARCTIC and BOREAL of the east Atlantic. In the ARCTIC in the restricted sense there are 4 species belonging 2 each to the subgenera *Evalea* and *Amaura*. In the ALEUTIC these two subgenera are found containing 15 out of the 19 species peculiar to it, the remainder comprising a single species of *Menestho*, 1 of *Strioturbonilla*, and 2 of *Pyrgolampros*, the last named subgenus being practically confined to the NORTH TEMPERATE province which harbors 23 out of the 26 species.

The NORTH TEMPERATE should embrace the OREGONIC and CALIFORNIC faunal areas which correspond to the CELTIC and LUSITANIAN of the east Atlantic. In this province there is as a leading feature the subgenus *Pyrgolampros*, only 1 species of which is known in the TROPIC province while 2 only are found in the ARCTIC. The subgenus *Mormula* is also quite characteristic; 2 out of 14 are found in the TROPIC, and none are known from the ARCTIC province. The subgenus *Ivara* is entirely confined to this province, and *Careliopsis* and *Salassiella* are known from the Californic faunal area only. *Evalea* finds its greatest development here, being represented by 49 of the 64 species known from the entire west coast.

The TROPIC province should embrace the MAZATLANIC, the PAN-AMIC and GALAPAGANIC, corresponding to the WEST AFRICAN of the east Atlantic. In this we find the following subgenera peculiar to the region, *Pyramidella*, *Pharcidella*, *Asmunda*, *Lysacme*, *Salassia*, *Pyrgulina*, *Haldra*, and *Odostomia*. The rather large subgenus *Amaura* is entirely unrepresented and *Pyrgolampros* has but a single representative.

From the SOUTH TEMPERATE province, corresponding to the SOUTH AFRICAN of the east Atlantic, we have but 4 representatives, 3 of which belong to the subgenus *Pyrgiscus* which ranges over the NORTH TEMPERATE and also the TROPIC, and one of the subgenus *Menestho*, which has an equally extensive distribution.

The ANTARCTIC Pyramidellid fauna is unknown at present, but judging from the currents, one notes that 2 faunal areas are indicated in the ANTARCTIC province; one, the MAGELLANIC, corresponding to the ALEUTIC of the northern hemisphere covering the

region between Chiloe Island and the Strait of Magellan, the other, the ANTARCTIC, in the restricted sense, corresponding to the ARCTIC, in the restricted sense, of the northern hemisphere, covering the South Shetlands and the territory to the south of them.

The present study is the first actual tabulation of the distribution of a large family of mollusks which has been undertaken for the region under discussion and marks well the various subdivisions of the larger provinces into which the continental shelf fauna of the west coast of America is divided. (See map, Plate 40.)

They may be defined as follows:

(1) *ARCTIC*.

This extends from the summer limit south to the winter limit of the pack ice, i. e., from the Sea-Horse Islands south to Hagemeister Island. This region is characterized by 4 species belonging to 2 subgenera. (See first column of the summary.)

(2) *ALEUTIC*.

This embraces the Aleutian Islands, the Alaskan Peninsula, and the main coast of Alaska with their adjacent islands south of Sitka, and probably the inland straits south to Dixon Entrance. This region is characterized by 19 species belonging to 5 subgenera; two additional species are common to this and the next area. (See second column of summary.)

(3) *OREGONIC*.

This faunal area extends from Sitka, Alaska, south to Point Conception, California, and probably south on the outside of San Miguel, Santa Rosa, and San Nicholas, and San Clemente Islands. It is characterized by 70 species belonging to 14 subgenera. Eleven additional species extend over this and the next area. (See third column of summary.)

(4) *CALIFORNIC*.

This extends from Point Conception, California, south to Cape St. Lucas, Lower California. It is characterized by 164 species belonging to 27 subgenera. Two species are common to this and the next area. (See fourth column of summary.)

(5) *MAZATLANIC*.

This extends from Cape St. Lucas, south to Acajutla, Guatemala. It is characterized by 75 species belonging to 26 subgenera. No species are common to this and the next area. (See fifth column of summary.)

(6) *PANAMIC*.

This area extends from Acajutla south perhaps to Aguja Point, Peru. It is characterized by 46 species, belonging to 19 subgenera. (See sixth column of summary.)

(7) *GALAPAGANIC*.

The fauna of these islands, though small, is absolutely distinct and denotes a separate area. It consists of 5 species belonging to 5 subgenera. (See seventh column of summary.)

The Pyramidellid material from the west coast of South America south of Aguja Point, Peru, is exceedingly scant, too much so to permit of any definite mapping of faunal areas based upon this group alone, but if we apply the same factors which are found to hold in the northern hemisphere, we can say that one area (8) the Peruvic, extends from Point Aguja, Peru, south to Chiloe Island, Chile. Another (9), the Magellanic, extends from Chiloe Island to the Strait of Magellan, and a third (10), the Antarctic, probably covers the South Shetlands, extending from there southwards.

The faunal areas here listed show a remarkable coincidence with the ocean currents in the region under discussion, which demands consideration.

First of all, it should be borne in mind that probably all the members of this family are free swimming during their early stages, which would render them subject to being carried by the ocean currents. Their future success in life after passing the free-swimming stage would depend upon finding a suitable habitat for their subsequent existence—a habitat which would embrace all the necessary conditions of topography, temperature, salinity, and food supply. It seems quite reasonable to suppose, and the insufficient data at hand indicate, that the coasts washed by the great ocean currents have in the main a corresponding uniformity of temperature, salinity, and food supply (plankton), the chief factors in the environment of marine animals. It therefore seems most reasonable to assume that it is due to the domination of these factors by the currents that we find the parallelism or coextensiveness of ocean currents and the faunal areas.

In the North Pacific we have the Kuro Siwo or Japan current, which on reaching our coast splits, the north deflection sweeping the shores of Alaska and the Aleutian Islands, marking the Aleutic faunal area, while the south deflection sweeps southward along the coast of Washington, Oregon, and California, as far as Point Conception, where the greater part is deflected seaward, probably sweeping the outside of San Miguel, Santa Rosa, San Nicholas, and San Clemente Islands, thus outlining the Oregonic faunal area.

A weak continuation of the main current passes southward along the coast of California from Point Conception to Cape St. Lucas, Lower California, where it is deflected seaward, thus covering the faunal area designated as Californic.

The equatorial current strikes the Central American coast about Acajutla and passes northward into the Gulf of California, turning westward at Cape St. Lucas. This maps the Mazatlanic faunal area.

The region between Acajutla and Point Aguja, Peru, appears to be free from any large ocean currents and represents the Panamic faunal area.

The South Pacific or Peruvian current strikes the South American shores about Chiloe Island, Chile, a part being deflected northward along the shores to Point Aguja, Peru, where it is deflected toward the Galapagos Islands. This may be considered as marking the Peruvic faunal area, though little is known of its Pyramidellid fauna.

Another part is deflected southward and sweeps the coast of South America from Chiloe Island to the Strait of Magellan. This maps the Magellanic faunal area.

The South Shetland Islands and the territory to the south may be considered as embracing the Antarctic faunal area in the restricted sense.

GEOGRAPHIC TABLES.

These tables are based upon the specific cards, showing the geographic range of each species. A 0 is used to denote its presence in a faunal area; when a species extends over more than one faunal area, the 0 will appear in all the columns covered by its range. Subspecies are given the same rank as species in the plotting of these tables.

Geographic tables.

Gen. PYRAMIDELLA.									
Subg. <i>Pyramidella</i> .									
<i>bairdi</i>						0			
Subg. <i>Volurops</i> .									
<i>auricomus</i>	Gulf Cal.					0			Maratlan.
<i>carrozzinus</i>						0			
Subg. <i>Longchaeus</i> .									
<i>adamsi</i>	Monterey			0	0	0			Gulf Cal.
<i>bicolor</i>						0			
<i>americana</i>	San Diego					0			Lower Cal.
<i>conica</i>							0		
<i>mazatlanica</i>	San Diego					0	0		Cape Tepoca.
Subg. <i>Pharcidella</i> .									
<i>hastata</i>						0			
<i>panamensis</i>							0		
<i>mojettei</i>						0			
<i>echinatus</i>	Gulf Cal.					0			Maratlan.
Gen. TURBONILLA.									
Subg. <i>Turbonilla</i> .									
<i>gilli</i>	Catalina				0				San Diego.
<i>g. delmontensis</i>				0					
<i>centrota</i>							0		
<i>ima</i>							0		
<i>diagensis</i>	San Pedro				0				San Diego.
<i>acuta</i>					0				
<i>lucana</i>						0			
<i>prolongata</i>						0			
Subg. <i>Chemnitzia</i> .									
<i>hypoleuca</i>	Catalina Id.				0				San Diego.
<i>gabriana</i>					0				
<i>acrynota</i>	San Pedro				0				S. Martin Id.
<i>muricata</i>						0			

Geographic tables—Continued.

	Southern extreme range.
G	
ga	Ian Diego.
ch	
pe	
ho	
ac	
me	Ian Ignacio.
ra	Ian Diego.
st.	
di	
pe	
be	
ca	Pt. Abreojos.
me	Barkley Bd.
at	Ian Diego.
en	Ian Diego.
ni	
ba	
to	Ian Diego.
st.	Coronado Id.
ca	
ca	
st.	Ian Diego.
pe	La Jolla.
pe	Cape St. Lucas.
st.	Ian Diego.
o-	
ec	Monterey.
di	
as	Ian Diego.
pe	Lower Cal.
pe	
us	
aj	
pi	
in	
er	
gr	
co	
ol	
al	
vi	Victoria.
gl	
ri	
ve	Monterey.
ne	Victoria.
ta	Barkley Bd.
ta	
lo	Ian Diego.
he	
ge	Ian Diego.
as	Puget Bd.
pe	Pt. Loma Lt.
he	Ian Diego.
ig	
ba	Catalina Id.
ai	Alaska Harbor.
cl	
gl	
pe	Ian Diego.
me	
ke	Catalina Id.
he	
pe	
ri	
li	
on	

Geographic tables—Continued.

<i>fovilla</i>					0		0		
<i>peruensis</i>					0				
<i>multingui</i>	San Pedro.....				0				San Diego.
<i>callia</i>					0				
<i>superba</i>						0			
<i>plato</i>					0				
<i>juvetti</i>	San Pedro.....				0				Lower Cal.
<i>signae</i>					0				
<i>striosa</i>							0		
<i>morchi</i>	Redondo.....				0				San Diego.
<i>aragoni</i>				0					
<i>recta</i>	San Diego.....				0				Pt. Abreojos.
<i>weldi</i>					0				
<i>nercia</i>	San Pedro.....				0				San Diego.
<i>antestriata</i>	Esteros B.....				0				Zuniga.
<i>entemunda</i>	S. Rosa I.....				0				Catalina Id.
<i>flavescens</i>						0			
<i>macbridei</i>						0			
<i>maera</i>					0				
<i>nuttalli</i>								0	
<i>angusta</i>	C. San Lucas.....					0			
<i>tenuscula</i>	Monterey.....			0	0				Pt. Abreojos.
<i>callimene</i>					0				
<i>virgo</i>					0				
<i>marshalli</i>						0			
<i>canfieldi</i>				0					
<i>aimo</i>					0				
<i>calitpeptum</i>							0		
<i>etna</i>							0		
<i>shimeki</i>								0	
<i>sacrorum</i>						0			
<i>eucosmodotis</i>	S. Luis Obispo.....				0				San Diego.
<i>halidoma</i>						0			
<i>auricoma</i>	San Pedro.....				0				Scammon Lagoon.
<i>custanea</i>	San Pedro.....				0				San Diego.
<i>custanella</i>				0					
<i>grippi</i>					0				
<i>indentata</i>						0			
<i>core</i>								0	
<i>craticulata</i>							0		
<i>cervata</i>						0			
<i>lepta</i>						0			
<i>hettas</i>						0			
<i>rubula</i>							0		
<i>wickhami</i>					0				
<i>kara</i>						0			
<i>cinctella</i>							0		
<i>adusta</i>					0				
<i>larunda</i>						0			
Subg. <i>Mormula</i> .									
<i>lordi</i>	Sitka Harbor.....			0					Pt. Orchard.
<i>ragina</i>	S. Rosa I.....				0				Catalina Id.
<i>catalinensis</i>					0				
<i>eschscholtzi</i>	Port Simpson.....			0					Barkley Id.
<i>tridentata</i>	Monterey.....			0					San Diego.
<i>embusta</i>					0				
<i>scammonensis</i>					0				
<i>major</i>							0		
<i>santocana</i>					0				
<i>pentalopha</i>	San Pedro.....				0				Todos Santos.
<i>heterolopha</i>	Ocean Beach.....				0				San Hipolito Pt.
<i>ignacia</i>					0				
<i>pericellida</i>					0				
<i>phalera</i>							0		
Subg. <i>Dunkeria</i> .									
<i>sedillina</i>						0			
<i>laminata</i>	San Pedro.....				0				Pt. Abreojos.
<i>hypoktenis</i>					0				

Geographic tables—Continued.

Gen. <i>TURBONILLA</i> —Con.							
Subg. <i>Dunkeria</i> —Continued.							
<i>excolpa</i>					0		
<i>subangulata</i>					0		
<i>andrewsi</i>						0	
<i>arata</i>				0			
<i>genilda</i>						0	
Subg. <i>Pyrgisculus</i> .							
<i>monilifera</i>					0		
<i>cancellata</i>					0		
<i>festiva</i>						0	
<i>eucornis</i>					0		
<i>swani</i>				0			
<i>paucilirata</i>					0		
Subg. <i>Aemunda</i> .							
<i>turrita</i>						0	
Subg. <i>Careliopsis</i> .							
<i>stenogyra</i>				0			
Gen. <i>ODOSTOMIA</i> .							
Subg. <i>Lysacme</i> .							
<i>clausiliformis</i>					0		
Subg. <i>Salassicella</i> .							
<i>laza</i>	Pacific Beach			0			Scammon Lagoon.
<i>richi</i>				0			
Subg. <i>Salassia</i> .							
<i>tropidita</i>						0	
<i>scalariformis</i>					0		
Subg. <i>Beala</i> .							
<i>conveza</i>	Cacachitas				0		Mazatlan.
<i>excolpa</i>					0		
<i>callimorpha</i>				0			
Subg. <i>Chrysallida</i> .							
<i>heterocincta</i>				0			
<i>reigeni</i>					0		
<i>inconspicua</i>						0	
<i>telescopium</i>					0		
<i>exceles</i>						0	
<i>acrybia</i>				0			
<i>communis</i>						0	
<i>torrita</i>					0		
<i>licina</i>				0			
<i>talamis</i>					0		
<i>effusa</i>	Mazatlan				0		C. St. Lucas.
<i>puspercula</i>						0	
<i>clathratula</i>						0	
<i>ritae</i>	Catalina I.			0			San Diego.
<i>rinelli</i>						0	
<i>eugenia</i>	San Pedro			0			San Hipolito Pt.
<i>trachis</i>				0			
<i>lucca</i>	Monterey	0		0			San Diego.
<i>clementina</i>				0			
<i>oonisca</i>					0		
<i>oldroydi</i>	San Pedro			0			Los Coronados I.
<i>nodosa</i>					0		
<i>ovata</i>					0		
<i>cincta</i>	San Pedro			0			Pacific Beach.
<i>loomisi</i>						0	
<i>vicola</i>				0			
<i>stricta</i>				0			
<i>cooperi</i>				0			
<i>hipolitensis</i>				0			

Geographic tables—Continued.

						Southern extreme range.
Gen. <i>ODOSTOMIA</i> —Con.						
Subg. <i>Chrysallida</i> —Con.						
<i>lepeana</i>				0		
<i>prasinus</i>					0	
<i>tyleri</i>					0	
<i>scammonensis</i>	Scammon Lag.			0		Pt. Abreojos.
<i>pulchra</i>					0	
<i>montereyensis</i>	Del Monte		0			San Luis Obispo B.
<i>pulchra</i>	Monterey		0	0		San Pedro.
<i>virginialis</i>	San Pedro		0	0		Pt. Abreojos.
<i>definita</i>					0	
<i>d. contracta</i>					0	
<i>d. difficilis</i>					0	
<i>oregonensis</i>	Q. Charlotte I.		0			Monterey.
<i>benckiana</i>				0		
<i>promecus</i>			0			
<i>pulcherrima</i>	San Pedro		0			San Diego.
<i>vinosa</i>			0			
<i>fasciata</i>				0		
<i>helga</i>	San Pedro		0			Coronado Id.
<i>dicella</i>			0			
<i>thalis</i>			0			
<i>sanctorum</i>	Todos Santos B.		0			San Hipolito Pt.
<i>aspis</i>			0			
<i>rotundata</i>				0		
<i>deceptrix</i>	S. Hipolito Pt.		0			Pt. Abreojos.
Subg. <i>Pyrgulina</i> .						
<i>marginata</i>					0	
Subg. <i>Egila</i> .						
<i>lacunata</i>				0		
<i>poppel</i>			0			
Subg. <i>Haldra</i> .						
<i>photis</i>				0		
Subg. <i>Iridella</i> .						
<i>pedroana</i>	San Pedro		0			Scammon Lagoon.
<i>nasalis</i>	San Pedro		0			Scammon Lagoon.
<i>n. delmontensis</i>			0			
<i>quinguecincta</i>				0		
<i>ovatus</i>				0		
Subg. <i>Mirvalda</i> .						
<i>hemphilli</i>	San Pedro		0			Pt. Abreojos.
<i>ornatus</i>				0		
<i>caerulis</i>				0		
<i>terrebellum</i>					0	
<i>argyrotus</i>	San Pedro		0			Cape St. Lucas.
<i>palupagensis</i>					0	
Subg. <i>Ivara</i> .						
<i>curricula</i>	Monterey		0	0		Pt. Abreojos.
Subg. <i>Evallina</i> .						
<i>americana</i>	San Pedro		0			Coronado Id.
<i>intermedia</i>				0		
Subg. <i>Iolaea</i> .						
<i>amiana</i>	Monterey B.		0	0		Pt. Abreojos.
<i>eucornia</i>	San Pedro		0	0		Pt. Abreojos.
<i>delicatula</i>				0		
Subg. <i>Meneatho</i> .						
<i>grammatospira</i>				0		
<i>pharida</i>			0			
<i>rara</i>			0			

Geographic tables—Continued.

						Panamic.	
Gen. <i>ODOSTOMIA</i> —Con.							
Subg. <i>Menestho</i> —Continued.							
<i>zispina</i>					0		
<i>rocia</i>					0		
<i>gloriosa</i>	San Diego			0			San Hipolito Pt.
<i>emilda</i>	San Diego			0			Round Island.
<i>callipyrga</i>					0		
<i>cuclos</i>				0			
<i>ferma</i>				0			
<i>cnora</i>				0			
<i>chilensis</i>						0	
<i>felilla</i>	Long Beach			0			San Ignacio Lag.
<i>hypocurtis</i>		0					
<i>aequaliculpa</i>				0			
<i>harfordensis</i>			0				
<i>subtilulata</i>				0			
Subg. <i>Evaless</i> .							
<i>nunitakensis</i>		0					
<i>hillismooensis</i>			0				
<i>poungi</i>			0				
<i>lhaa</i>				0			
<i>calliope</i>				0			
<i>calcarella</i>				0			
<i>tillamookensis</i>				0			
<i>esilda</i>				0			
<i>spreadboroughi</i>				0			
<i>vancouverensis</i>				0			
<i>aleutica</i>	Bering Sea		0				Amaknak Id.
<i>kadiakensis</i>			0				
<i>quadrac</i>				0			
<i>callimene</i>				0			
<i>herilda</i>				0			
<i>cypris</i>				0			
<i>hypatia</i>				0			
<i>tenuis</i>					0		
<i>valdesi</i>	Barkley S.			0			Del Monte.
<i>nemo</i>	San Pedro			0			San Diego.
<i>id.</i>	S. Barbara			0			San Diego.
<i>barkleyensis</i>				0			
<i>pretoma</i>				0			
<i>cookeana</i>				0			
<i>septentrionalis</i>		0					
<i>capitana</i>	Kadiak I.		0				Unalaska.
<i>jeuettii</i>				0			
<i>inflata</i>				0			
<i>columbiana</i>	Vancouver I.		0				Port Townsend.
<i>unalaskensis</i>		0					
<i>stessa</i>				0			
<i>obesa</i>				0			
<i>lucana</i>				0			
<i>phanea</i>				0			
<i>phacella</i>	San Pedro			0			San Diego.
<i>astiroseana</i>				0			
<i>tenuisculpta</i>	Barkley S.			0			Lower Cal.
<i>angularis</i>	Sitka Harbor			0			California.
<i>socorroensis</i>					0		
<i>baldrigae</i>				0			
<i>donilla</i>	San Pedro			0			Todos Santos Bay.
<i>californica</i>	Ocean Beach			0			S. Coronado I.
<i>serilla</i>	San Pedro			0			San Diego.
<i>tascomaensis</i>			0				
<i>amchitkana</i>	Ellamar	0	0				Amchitka Id.
<i>stephensi</i>	Baranof I.		0				Barkley Id.
<i>classini</i>	Admiralty I.		0				Sitka.
<i>minutissima</i>	San Diego			0			Pt. Abrejos.
<i>raymondi</i>				0			
<i>gravidia</i>				0			
<i>notilla</i>				0			
<i>novilla</i>				0			
<i>altina</i>				0			
<i>profundicola</i>				0			
<i>baranofensis</i>	Admiralty I.		0				Baranof Id.
<i>sitkaensis</i>		0					
<i>hagemelsteri</i>				0			
<i>stidegatenensis</i>				0			

Geographic tables—Continued.

Species.	Northern extreme range.	Arctic.	Aleutic.	Oregonic.	Californic.	Mexicanic.	Panamic.	Galapaganic.	Peruvic.	Southern extreme range.
Gen. <i>ODOSTOMIA</i> —Con.										
Subg. <i>Eveles</i> —Continued.										
<i>rezina</i>					0					Monterey.
<i>delicatosa</i>	Barkley S.			0						
<i>parvella</i>							0	0		
<i>granadensis</i>						0				
<i>palmeri</i>				0						
<i>cassandra</i>				0						
Subg. <i>Amaura</i> .										
<i>lastra</i>	S. Catalina.				0					Southern Cal. Pt. Pinos Lt.
<i>kennerleyi</i>	Nanaimo.		0	0						
<i>clis</i>		0								
<i>beringi</i>					0					
<i>subglobosa</i>					0					
<i>secura</i>				0						
<i>helena</i>					0					
<i>grippiana</i>					0					
<i>ferallensis</i>					0					
<i>siliana</i>			0							
<i>calpa</i>	Mole Harbor.			0						Sitka
<i>krasni</i>			0							
<i>elidorena</i>			0							
<i>orca</i>	S. Rosa I.				0					San Diego.
<i>gouldi</i>				0						
<i>arctica</i>	Arctic O.	0	0							Bristol Bay.
<i>acellena</i>				0						
<i>moratoru</i>				0						
<i>peas</i>			0							
<i>nota</i>	S. Rosa I.				0					San Diego.
<i>ilialukensis</i>			0							
<i>nactiformis</i>				0						
<i>canfieldi</i>	Barkley S.			0	0					San Diego.
<i>subarctica</i>	S. Rosa I.				0					Todos Santos B.
<i>maritima</i>			0							
Subg. <i>Scalenostoma</i> .										
<i>detella</i>						0				
<i>babylonis</i>					0					
<i>rengii</i>							0			
Subg. <i>Heida</i> .										
<i>kelleyi</i>					0					
<i>panamensis</i>							0			
Subg. <i>Odosstomia</i> .										
<i>farilla</i>					0					
<i>discula</i>					0					
<i>coronadensis</i>					0					
<i>mammillata</i>						0				

Geographic tables—Continued.

SUMMARY.

Genera and subgenera.	Arctic.	Aleutic.	Oregonic.	Californic.	Mazatlanic.	Panamic.	Galapaganic.	Peruvic.	Total number of species of each subgenus.				
Gen. PYRAMIDELLA.													
<i>Pyramidella</i>					1				1				
<i>Voluspa</i>				1	1				2				
<i>Longchacus</i>			1	1	3	2	1		5				
<i>Pharcidella</i>					3	1			4				
Total.....									12				
Gen. TURBONILLA.													
<i>Turbonilla</i>			1	3	2	2			8				
<i>Chemnitzia</i>			2	6	1	2	1		12				
<i>Strioturbonilla</i>		1	1	3	1	15	9	5	33				
<i>Ptycheulimella</i>				1	1				2				
<i>Pyrgolampros</i>		2	12	1	12	1			26				
<i>Pyrgiculus</i>			4	1	25	14	7	1	53				
<i>Mormula</i>			3	1	10		2		14				
<i>Dunkeria</i>				3	3	2			8				
<i>Pyrgiculus</i>				1	4	1			6				
<i>Asmunda</i>						1			1				
<i>Cerithiopsis</i>				1					1				
Total.....									163				
Gen. ODOSTOMIA.													
<i>Lysoacme</i>					1				1				
<i>Salassella</i>				2					2				
<i>Salassia</i>					1	1			2				
<i>Beala</i>				1	2				3				
<i>Chrysallida</i>			6	2	25	11	13		53				
<i>Pyrgulina</i>						1			1				
<i>Egila</i>				1	1				2				
<i>Haldra</i>					1				1				
<i>Iridella</i>			1	2	1	1			5				
<i>Mitridia</i>				2	2	1	1		6				
<i>Isoara</i>			1	1	1				3				
<i>Ecalina</i>				1	1				2				
<i>Iolaea</i>			1	1	2	1			5				
<i>Macantho</i>		1	3	1	6	4	2		17				
<i>Eoalea</i>	2	1	8	1	23	1	4	1	34				
<i>Amazuro</i>	2	1	7	9	1	27			49				
<i>Scalenostoma</i>				1	1	1			3				
<i>Haida</i>				1		1			2				
<i>Odostomia</i>				3	1				4				
Total.....									197				
Grand total.....	4	*2	19	*2	70	*11	164	*2	75	46	5	4	373

* The numbers placed on the lines dividing the faunal columns indicate the number of species common to two adjacent areas.

DISTRIBUTION OF SPECIES.

In this list I have cited under each species all the available information in the following sequence: Locality from which the material was obtained including station number, depth in fathoms, character of bottom, bottom temperature, salinity, number of specimens, and disposition of material examined.

PYRAMIDELLA (PYRAMIDELLA) BAIRDI Dall and Bartsch.

Gulf of California: 1 specimen, type. Cat. No. 73932, U.S.N.M.

PYRAMIDELLA (VOLUSPA) AURICOMA Dall.

Gulf of California: 3 specimens (1=type). Cat. No. 82268, U.S.N.M.

Mazatlan, Mexico: 1 specimen. Cat. No. 168681, U.S.N.M.

PYRAMIDELLA (VOLUSPA) CERROSANA Dall and Bartsch.

Cerros Island, Lower California: 1 specimen, type. Cat. No. 6332, U.S.N.M.

PYRAMIDELLA (LONGCHAEUS) ADAMSI Carpenter.

Monterey, Cal.: 1 specimen. Cat. No. 206854, U.S.N.M.

Off Santa Rosa Island, Cal.: U.S.B.F. station 2901, 48 fathoms, gray sand and mud bottom. Bottom temperature 55.1°. 1 specimen. Cat. No. 194465, U.S.N.M.

San Diego, Cal.: 1 specimen. Cat. No. 56764, U.S.N.M.

7 specimens. Cat. No. 46469, U.S.N.M.

1 specimen. Cat. No. 109367, U.S.N.M.

3 specimens. Kelsey collection. 4 fathoms.

Scammon Lagoon, Lower California: 2 specimens. Kelsey collection.

3 specimens. Cat. No. 105558, U.S.N.M.

La Paz, Lower California: 1 specimen. Cat. No. 34171, U.S.N.M.

1 specimen. Cat. No. 11866, U.S.N.M.

Gulf of California: 2 specimens. Cat. No. 46468, U.S.N.M.

PYRAMIDELLA (LONGCHAEUS) BICOLOR Menke.

Guacamayo, Mexico: 1 specimen. Cat. No. 13522, U.S.N.M.

PYRAMIDELLA (LONGCHAEUS) MEXICANA Dall and Bartsch.

San Diego, Cal.: 1 specimen. Cat. No. 56764, U.S.N.M.

Scammon Lagoon, Lower California: 1 specimen, type. Cat. No. 105558, U.S.N.M.

PYRAMIDELLA (LONGCHAEUS) CONICA C. B. Adams.

Panama Bay: 1 specimen, type. Amherst College collection.

PYRAMIDELLA (LONGCHAEUS) MAZATLANICA Dall and Bartsch.

San Diego, Cal.: 2 specimens. Cat. No. 46477, U.S.N.M.

Off San Diego, Cal.: U.S.B.F. station 3566, 3 fathoms, fine sand and black shell bottom. 1 specimen. Cat. No. 206855, U.S.N.M.

Gulf of California: 1 specimen. Cat. No. 46468, U.S.N.M.

Off Cape Tepoca, Mexico: U.S.B.F. station 3019, 14 fathoms, black sand and broken shell bottom, bottom temperature 66°. 1 specimen, type. Cat. No. 162714, U.S.N.M.

PYRAMIDELLA (PHARCIDELLA) HASTATA A. Adams.

Acapulco, Mexico: 3 specimens (1 figured). Cat. No. 59321, U.S.N.M.

(?) 2 specimens. Zoological Museum of Berlin.

PYRAMIDELLA (PHARCIDELLA) PANAMENSIS Dall and Bartsch.

Panama Bay: U.S.B.F. station 2805, 51.5 fathoms, green mud bottom. 2 specimens (1=type). Cat. No. 122792, U.S.N.M.

PYRAMIDELLA (PHARCIDELLA) MOFFATI Dall and Bartsch.

Japan (?): 1 specimen. Paetel collection, Berlin Museum.

Acapulco, Mexico: 1 specimen, type. ? collection.

PYRAMIDELLA (PHARCIDELLA) ACHATES Gould.

Gulf of Mexico: 1 specimen, type. Cat. No. 43 (288-A.3111), State Museum, N. Y.

Mazatlan, Mexico: 1 specimen. Cat. No. 57870, Acad. Nat. Sci. Philadelphia, Pa.

TURBONILLA (TURBONILLA) GILLI Dall and Bartsch.

Off Catalina Island, Cal.: Univ. of Cal. station 30. 1 specimen. Univ. of Cal. collection.

San Diego, Cal.: Univ. of Cal. station 47. 3 specimens. Univ. of Cal. collection. 2 specimens (1=type). Cat. No. 163009, U.S.N.M.

TURBONILLA (TURBONILLA) GILLI DELMONTENSIS Dall and Bartsch.

Del Monte, Monterey, Cal.: 1 specimen, type. 12 fathoms. Cat. No. 195921, U.S.N.M.

TURBONILLA (TURBONILLA) CENTROTA Dall and Bartsch.

Panama: 1 specimen, type. Cat. No. 219, Amherst College.

TURBONILLA (TURBONILLA) IMA Dall and Bartsch.

Gulf of Panama: U. S. B. F. station 3392, 12-70 fathoms, hard bottom, bottom temperature, 36.4°. 1 specimen, type. Cat. No. 123025, U.S.N.M.

TURBONILLA (TURBONILLA) DIEGENSIS Dall and Bartsch.

San Pedro, Cal.: 17 specimens. Cat. No. 163217, U.S.N.M.

20 specimens. Oldroyd collection.

San Diego, Cal.: 1 specimen, type. Cat. No. 130316, U.S.N.M.

2 specimens. Cat. No. 10916, U.S.N.M.

7 specimens. Cat. No. 195334, U.S.N.M.

22 specimens. Baker collection.

2 specimens. 12-30 fathoms. Baker collection.

Off San Diego, Cal.: 3 specimens. Univ. of Cal. collection.

TURBONILLA (TURBONILLA) ACRA Dall and Bartsch.

Off Catalina Island, Cal.: 1 specimen, type. Cat. No. 206848, U.S.N.M.

TURBONILLA (TURBONILLA) PROLONGATA Carpenter.

Mazatlan, Mexico: 1 specimen, type. Tablet 1995, Liverpool collection, British Museum.

TURBONILLA (TURBONILLA) LUCANA Dall and Bartsch.

Cape St. Lucas, Lower California: 1 specimen, type. Cat. No. 4103, U.S.N.M.

TURBONILLA (CHEMNITZIA) HYPOLISPA Dall and Bartsch.

Off Catalina Island, Cal.: Univ. of Cal. station 32. 1 specimen. Cat. No. 205940, U.S.N.M.

San Diego, Cal.: 1 specimen. Univ. of Cal. collection.

1 specimen. 12-30 fathoms. Baker collection.

Off San Diego, Cal.: Univ. of Cal. stations 47 and 73. 2 specimens. Univ. of Cal. collection.

Univ. of Cal. station 43. 2 specimens, cotypes. Cat. No. 206851, U.S.N.M.

Univ. of Cal. station 43. 1 specimen. Cat. No. 206852, U.S.N.M.

TURBONILLA (CHEMNITZIA?) GABBIANA Cooper.

Habitat, Monterey, Cal.: 1 specimen. California Geological Survey.

TURBONILLA (CHEMNITZIA) AEPYNOTA Dall and Bartsch.

San Pedro, Cal.: 3 specimens. Cat. No. 163242, U.S.N.M.

Off San Martin Island, Lower California: 1 specimen, type. 30 fathoms. Cat. No. 162443, U.S.N.M.

San Diego, Cal.: 1 specimen. Gripp collection.

Outside of kelp, off San Diego Harbor, Cal.: 1 specimen. 16-20 fathoms. Gripp collection.

TURBONILLA (CHEMNITZIA) MURICATA Carpenter.

Mazatlan, Mexico: 2 specimens (1=type). Tablet 1993, Liverpool collection, British Museum.

TURBONILLA (CHEMNITZIA) SANTAROSANA Dall and Bartsch.

Off Santa Rosa Island, Cal.: U. S. B. F. station 2902, 53 fathoms, fine gray sand and mud bottom, bottom temperature, 45°. 6 specimens (1=type). Cat. No. 163239, U.S.N.M.

U. S. B. F. station 2901, 48 fathoms, gray sand and mud bottom, bottom temperature 55.1°. 6 specimens. Cat. No. 163240, U.S.N.M.

Off Newport, Cal.: Univ. of Cal. station 19. 1 specimen. Univ. of Cal. collection.

Off San Diego, Cal.: Univ. of Cal. station 81. 4 specimens. Univ. of Cal. collection.

TURBONILLA (CHEMNITZIA) CLARINDA Bartsch.

San Diego Bay, Cal.: 3 specimens (1=type). 12-30 fathoms. Cat. No. 211546, U.S.N.M.

5 specimens. 12-30 fathoms. Kelsey collection.

TURBONILLA (CHEMNITZIA) PARAMOEA Dall and Bartsch.

Panama: 1 specimen, type. Amherst College collection.

TURBONILLA (CHEMNITZIA) HOUSERI Dall and Bartsch.

Off Galapagos Islands, South America: U. S. B. F. station 2813, 40 fathoms, coral and sand bottom. 2 specimens, cotypes. Cat. No. 206853, U.S.N.M.

TURBONILLA (CHEMNITZIA) ACULEUS C. B. Adams.

Panama: 2 specimens. Amherst College collection.

TURBONILLA (CHEMNITZIA) MURICATOIDES Dall and Bartsch.

Monterey, Cal.: 1 specimen, type. Cat. No. 195942, U.S.N.M.

1 specimen. Cat. No. 160488, U.S.N.M.

TURBONILLA (CHEMNITZIA) KELSEYI Dall and Bartsch.

Santa Barbara, Cal.: 3 specimens. Cat. No. 56789, U.S.N.M.

San Pedro, Cal.: 22 specimens. Cat. No. 152197, U.S.N.M.

Pacific Beach, San Diego, Cal.: 1 specimen. Cat. No. 162435, U.S.N.M.

Ocean Beach, San Diego, Cal.: 2 specimens. 10 fathoms. Cat. No. 152314, U.S.N.M.

San Diego, Cal.: 2 specimens. Cat. No. 60916, U.S.N.M.

1 specimen, type. Cat. No. 46506, U.S.N.M.

5 specimens. 12-30 fathoms. Baker collection.

28 specimens. Kelsey collection.

4 specimens. Gripp collection.

Outside of kelp, off San Diego Harbor, Cal.: 4 specimens. 16-20 fathoms. Gripp collection.

Todos Santos Bay, Cal.: 2 specimens. Cat. No. 46503, U.S.N.M.

Point Abrejos, Lower Cal.: 2 specimens. Cat. No. 106513, U.S.N.M.

San Ignacio, Lower Cal.: 1 specimen. Cat. No. 162432, U.S.N.M.

TURBONILLA (CHEMNITZIA) RAYMONDI Dall and Bartsch.

Off Santa Rosa Island, Cal.: U. S. B. F. station 2901, 48 fathoms, gray sand and mud bottom, bottom temperature 55.1°. 1 specimen. Cat. No. 163252a, U.S.N.M.

White's Point, San Pedro, Cal.: 9 specimens. Oldroyd collection.

Off Catalina Island, Cal.: 1 specimen, type. Cat. No. 206849, U.S.N.M.

1 specimen. Univ. of Cal. collection.

San Diego, Cal.: 1 specimen. Cat. No. 206850, U.S.N.M.

2 specimens. 12-30 fathoms. Baker collection.

Off San Diego, Cal.: 4 specimens. Univ. of Cal. collection.

TURBONILLA (STRIOTURBONILLA) STEPHANOGYRA Dall and Bartsch.

Panama Bay: U. S. B. F. station 2799, 29½ fathoms, green mud bottom. 1 specimen, type. Cat. No. 162440, U.S.N.M.

TURBONILLA (STRIOTURBONILLA) DINORA Bartsch.

San Diego Bay, Cal.: 1 specimen, type. Cat. No. 211553, U.S.N.M.

San Diego, Cal.: 1 specimen. Gripp collection.

TURBONILLA (STRIOTURBONILLA) PANAMENSIS C. B. Adams.

Panama: 6 specimens. Amherst College collection.

TURBONILLA (STRIOTURBONILLA) BUTTONI Dall and Bartsch.

Off Santa Rosa Island, Cal.: U. S. B. F. station 2901, 48 fathoms, gray sand and mud bottom, bottom temperature 55.1°.

1 specimen. Cat. No. 163246, U.S.N.M.

2 specimens. Cat. No. 56867, U.S.N.M.

San Pedro, Cal.: 2 specimens. Cat. No. 205938, U.S.N.M.
12 specimens. Cat. No. 206939, U.S.N.M.
5 specimens. Cat. No. 203245a, U.S.N.M.
10 specimens (1=type). Cat. No. 163241, U.S.N.M.
1 specimen. Baldrige collection.
2 specimens. Berry collection.
65 specimens. Oldroyd collection.
(White's Point) 4 specimens. Oldroyd collection.

Laguna Beach, Cal.: 3 specimens. Ball collection.

Catalina Island, Cal.: 1 specimen. Cat. No. 162436, U.S.N.M.

Ocean Beach, Cal.: 1 specimen. Kelsey collection.

San Diego, Cal.: 2 specimens. Cat. No. 160491, U.S.N.M.

1 specimen. Cat. No. 152314a, U.S.N.M.

2 specimens. Arnold collection.

2 specimens. Baker collection.

1 specimen. Kelsey collection.

Todos Santos Bay, Lower Cal.: 2 specimens. Cat. No. 56358, U.S.N.M.

3 specimens. Cat. No. 46503, U.S.N.M.

San Martin Island, Lower Cal.: 5 specimens. Baker collection.

5 specimens. Kelsey collection.

Point Abrejos, Lower Cal.: 3 specimens. Cat. No. 106513, U.S.N.M.

TURBONILLA (STRIOTURBONILLA) VANCOUVERENSIS Baird.

Kadiak Island, Alaska: 2 specimens. 13 fathoms. Cat. No. 169489, U.S.N.M.

Port Etches, Alaska: 1 specimen. Cat. No. 160993, U.S.N.M.

Lituya Bay, Alaska: 1 specimen. 8 fathoms. Cat. No. 160490, U.S.N.M.

Port Simpson, British Columbia: 3 specimens. Cat. No. 196183, U.S.N.M.

11 specimens. Taylor collection.

West of Rose Spit, Dixon Entrance, Queen Charlotte Islands, British Columbia: 2 specimens. Taylor collection.

Alert Bay, British Columbia: 1 specimen. Taylor collection.

Carter Bay, British Columbia: 1 specimen. Cat. No. 196184, U.S.N.M.

1 specimen. Taylor collection.

Departure Bay, British Columbia: 20 specimens. Taylor collection.

5 specimens. Cat. No. 196185, U.S.N.M.

Victoria, Vancouver Island, British Columbia: 4 specimens. Cat. No. 126670, U.S.N.M.

Barkley Sound, British Columbia: 32 specimens. Cat. No. 211567, U.S.N.M.

33 specimens. Can. Geol. Surv. collection.

TURBONILLA (STRIOTURBONILLA) ASSER Dall and Bartsch.

Redondo, Cal.: 2 specimens (1=type). Cat. No. 205932, U.S.N.M.

San Pedro, Cal.: 2 specimens. Cat. No. 205933, U.S.N.M.

2 specimens. Cat. No. 163244, U.S.N.M.

1 specimen. Oldroyd collection.

San Diego, Cal.: 1 specimen. 12-30 fathoms. Baker collection.

(Sandspit.) 1 specimen. Cook collection.

2 specimens. Gripp collection.

Outside of kelp, off San Diego Harbor, Cal.: 2 specimens. 16-20 fathoms. Gripp collection.

TURBONILLA (STRIOTURBONILLA) MEXICANA Dall and Bartsch.

Off Lower California: U.S.B.F. station 2830, 66 fathoms, fine sand bottom; bottom temperature 74.1°. 4 specimens (1=type). Cat. No. 162515, U.S.N.M.

U.S.B.F. station 2830, 66 fathoms, fine sand bottom; bottom temperature 74.1°. 5 specimens. Cat. No. 96561, U.S.N.M.

Off La Paz, Lower California: U.S.B.F. station 2823, 26½ fathoms, broken shell bottom. 4 specimens. Cat. No. 163253, U.S.N.M.

U.S.B.F. station 2826, 9½ fathoms, shell bottom. 1 specimen. Cat. No. 191556, U.S.N.M

TURBONILLA (STRIOTURBONILLA) ATTRITA Dall and Bartsch.

Long Beach, Cal.: 1 specimen. Berry collection.

San Pedro, Cal.: 7 specimens (1=type). Cat. No. 163248, U.S.N.M.

5 specimens. Cat. No. 163243, U.S.N.M.

8 specimens. Oldroyd collection.

2 specimens. Oldroyd collection.

Off Point Loma, Cal.: 2 specimens. 5-8 fathoms. Baker collection.

San Diego, Cal.: 1 specimen. Cat. No. 152314, U.S.N.M.

2 specimens. Oldroyd collection.

Off Hotel. 1 specimen. 35 fathoms. Baker collection.

12 specimens. Kelsey collection.

San Diego Bay, Cal.: 5 specimens. Baker collection.

TURBONILLA (STRIOTURBONILLA) ENCELLA Bartsch.

San Pedro, Cal.: 1 specimen, type. Cat. No. 211547, U.S.N.M.

TURBONILLA (STRIOTURBONILLA) NICHOLSI Dall and Bartsch.

Gulf of California: 1 specimen, type. Cat. No. 160210, U.S.N.M.

TURBONILLA (STRIOTURBONILLA) BAKERI Bartsch.

San Diego Bay, Cal.: 1 specimen, type. Cat. No. 211549, U.S.N.M.

1 specimen. Baker collection.

TURBONILLA (STRIOTURBONILLA) TORQUATA Gould.

Point Fermin, Cal.: 1 specimen, figured. Cat. No. 205934, U.S.N.M.

Catalina Island, Cal.: 2 specimens. 40 fathoms. Berry collection.

Off La Jolla, Cal.: U.S.B.F. station 4322, 110-197 fathoms, green mud and shell bottom. 1 specimen. Cat. No. 205935, U.S.N.M.

San Diego, Cal.: 1 specimen. Cat. No. 60916, U.S.N.M.

San Diego Bay, Cal.: 3 specimens. 12-30 fathoms. Baker collection.

Off San Diego, Cal.: Univ. of Cal. stations 47 and 82. 2 specimens. Univ. of Cal. collection.

TURBONILLA (STRIOTURBONILLA) STYLINA Carpenter.

Monterey, Cal.: 1 specimen, figured. 8-10 fathoms. Cat. No. 56429, U.S.N.M.
1 specimen. Kelsey collection.

Del Monte, Cal.: 1 specimen. 12 fathoms. Cat. No. 165199, U.S.N.M.

Off Coronado Islands, Lower Cal.: U.S.B.F. station 2932, 20 fathoms, gray sand and broken shell bottom; bottom temperature 58°. 2 specimens. Cat. No. 163249, U.S.N.M.

TURBONILLA (STRIOTURBONILLA) CALVINI Dall and Bartsch.

Off La Paz, Lower California: U.S.B.F. station 2832, 26½ fathoms, broken shell bottom. 6 specimens (2=cotypes). Cat. No. 162442, U.S.N.M.

TURBONILLA (STRIOTURBONILLA) CARPENTERI Dall and Bartsch.

San Pedro, Cal.: 1 specimen, type. Cat. No. 160065, U.S.N.M.

2 specimens. Oldroyd collection.

TURBONILLA (STRIOTURBONILLA) SIMPSONI Dall and Bartsch.

Off Redondo, Cal.: Univ. of Cal. station 12. 4 specimens. Univ. of Cal. collection.

Off Long Beach, Cal.: Univ. of Cal. station 47. 1 specimen. Univ. of Cal. collection.

Off San Pedro, Cal.: 2 specimens (1=type). 10 fathoms. Cat. No. 152750, U.S.N.M.

4 specimens. Cat. No. 163247, U.S.N.M.

1 specimen. Cat. No. 122750, U.S.N.M.

Off Catalina Island, Cal.: Univ. of Cal. station 27. 1 specimen. Univ. of Cal. collection.

San Diego, Cal.: 1 specimen. Cat. No. 1523145, U.S.N.M.

2 specimens. Cat. No. 205941, U.S.N.M.

6 specimens. Kelsey collection.

5 specimens. Gripp collection.

Outside of kelp, off San Diego Harbor, Cal.: 5 specimens. 16-20 fathoms. Gripp collection.

TURBONILLA (STRIOTURBONILLA) PROFUNDICOLA Dall and Bartsch.

Off Catalina Island, Cal.: 1 specimen. Univ. of Cal. collection.

Off La Jolla, Cal.: U.S.B.F. station 4322, 110-197 fathoms, green mud and shell bottom. 1 specimen, type. Cat. No. 206856, U.S.N.M.

TURBONILLA (STRIOTURBONILLA) GALIANOI Dall and Bartsch.

Pacific Beach, San Diego, Cal.: 3 specimens. Cat. No. 162437, U.S.N.M.

San Hipolito Point, Lower Cal.: 3 specimens. Cat. No. 162438, U.S.N.M.

2 specimens. Arnold collection.

1 specimen. Cat. No. 162441, U.S.N.M.

Point Abrejos, Lower California: 2 specimens. Cat. No. 162439, U.S.N.M.

Cape St. Lucas, Lower California: 2 specimens (1=type). Cat. No. 4104, U.S.N.M.

TURBONILLA (STRIOTURBONILLA) HUMEROSA Dall and Bartsch.

Off Catalina Island, Cal.: 1 specimen, type. Cat. No. 206857, U.S.N.M.

San Diego, Cal.: 2 specimens. Cat. No. 205937, U.S.N.M.

TURBONILLA (STRIOTURBONILLA) C-B-ADAMSI Carpenter.

Mazatlan, Mexico: 13 specimens (1=type). Tablet 1990, Liverpool collection, British Museum.

TURBONILLA (STRIOTURBONILLA) SERRAE Dall and Bartsch.

Barkley Sound, British Columbia: 18 specimens. Can. Geol. Sur. collection.

11 specimens. Cat. No. 211568, U.S.N.M.

Del Monte, Monterey, Cal.: 6 specimens. 12 fathoms. Berry collection.

2 specimens (1=type). 12 fathoms. Cat. No. 196198, U.S.N.M.

Off Pacific Grove, Monterey, Cal.: 1 specimen. 40 fathoms. Cat. No. 196200, U.S.N.M.

Monterey, Cal.: 1 specimen. 29 fathoms. Berry collection.

TURBONILLA (STRIOTURBONILLA) DRACONA Bartsch.

San Diego, Cal.: 1 specimen, type. Cat. No. 211548, U.S.N.M.

TURBONILLA (STRIOTURBONILLA) ARESTA Dall and Bartsch.

Off Santa Rosa Island, Cal.: U.S.B.F. station 2901, 48 fathoms, gray sand and mud bottom; bottom temperature 55.1°. 1 specimen. Cat. No. 163252, U.S.N.M.

Off Catalina Island, Cal.: 10 specimens (1=type). Cat. No. 206858, U.S.N.M.

San Diego, Cal.: 1 specimen. Cat. No. 206863, U.S.N.M.

1 specimen. 12-30 fathoms. Baker collection.

1 specimen. Kelsey collection.

1 specimen. Gripp collection.

Midspit, San Diego Bay, Cal.: 1 specimen. Baker collection.

Off San Diego, Cal.: 5 specimens. Univ. of Cal. collection.

TURBONILLA (STRIOTURBONILLA) PAZANA Dall and Bartsch.

Off Cerralvo Island, Gulf of California: U. S. B. F. stations 2826-2828, 9½ to 10 fathoms, shell bottom. 3 specimens. Cat. No. 191565, U.S.N.M.

U. S. B. F. stations 2826-2828, 9½ to 10 fathoms, shell bottom. 7 specimens. Cat. No. 162431, U.S.N.M.

Off La Paz, Lower California: U. S. B. F. station 2822, 21 fathoms, gray sand and broken shell bottom. 2 specimens. Cat. No. 163250, U.S.N.M.

U. S. B. F. station 2823, 26½ fathoms, broken shell bottom. 36 specimens (1=type). Cat. No. 162430, U.S.N.M.

TURBONILLA (STRIOTURBONILLA) GALAPAGENSIS Dall and Bartsch.

Off Galapagos Islands, South America: U. S. B. F. station 2808, 634 fathoms, coral and sand bottom; bottom temperature 39.9°. 1 specimen, type. Cat. No. 206859, U.S.N.M.

TURBONILLA (STRIOTURBONILLA) UNDATA Carpenter.

Mazatlan, Mexico: 1 specimen. Tablet 2002, Liverpool collection, British Museum.

TURBONILLA (STRIOTURBONILLA) AFFINIS C. B. Adams.

Panama: 1 specimen, type. Amherst College collection.

TURBONILLA (STRIOTURBONILLA) PHANEA Dall and Bartsch.

Off La Paz in the Gulf of California: U. S. B. F. station 2823, 26½ fathoms, broken shell bottom. 3 specimens (1=type). Cat. No. 206860, U.S.N.M.

Off Cerralvo Island, Lower California: U. S. B. F. stations 2826 to 2828, 9½ to 10 fathoms, shell bottom. 5 specimens. Cat. No. 206861, U.S.N.M.

Off La Paz, Lower California: U. S. B. F. station 2822, 21 fathoms, gray sand and broken shell bottom. Cat. No. 163251, U.S.N.M.

TURBONILLA (STRIOTURBONILLA) IMPERIALIS Dall and Bartsch.

Panama: 1 specimen, type. Cat. No. 206862, U.S.N.M.

TURBONILLA (STRIOTURBONILLA) SMITHSONI Dall and Bartsch.

Cape St. Lucas, Lower California: 1 specimen, type. Cat. No. 160068, U. S. N. M.

Boca de los Piedras: 1 specimen. Cat. No. 46502, U.S.N.M.

TURBONILLA (STRIOTURBONILLA) GRACILIOR C. B. Adams.

Panama: 1 specimen. Amherst College collection.

TURBONILLA (STRIOTURBONILLA) COOKEANA Bartsch.

Gulf of California: 1 specimen, type. Cat. No. 211550, U.S.N.M.

TURBONILLA (PTYCHEULIMELLA) OBSOLETA Carpenter.

Mazatlan, Mexico: 1 specimen. Tablet 2011, Liverpool collection, British Museum.

TURBONILLA (PTYCHEULIMELLA) ABREOJENSIS Dall and Bartsch.

Point Abrejos, Lower California: 1 specimen, type. Cat. No. 205951, U.S.N.M.

TURBONILLA (PYRGOLAMPROS) VICTORIANA Dall and Bartsch.

Departure Bay, British Columbia: 6 specimens. Taylor collection.

4 specimens. Cat. No. 196220, U.S.N.M.

Barkley Sound, British Columbia: 3 specimens. Can. Geol. Sur. collection.

2 specimens. Cat. No. 211571, U.S.N.M.

Victoria, Vancouver Island, British Columbia: 1 specimen, type. Cat. No. 126660a, U.S.N.M.

TURBONILLA (PYRGOLAMPROS) GIBBOSA Carpenter.

Mazatlan, Mexico: 2 specimens. Tablet 1996, Liverpool collection, British Museum.

TURBONILLA (PYRGOLAMPROS) RIDGWAYI Dall and Bartsch.

San Diego, Cal.: 1 specimen, type. Cat. No. 162560, U.S.N.M.

TURBONILLA (PYRGOLAMPROS) VALDEZI Dall and Bartsch.

Barkley Sound, British Columbia: 1 specimen. Can. Geol. Sur. collection.

Pacific Grove, Cal.: 1 specimen. Cat. No. 176624, U.S.N.M.

Monterey, Cal.: 1 specimen, type. Cat. No. 32273, U.S.N.M.

TURBONILLA (PYRGOLAMPROS) NEWCOMBEI Dall and Bartsch.

Port Simpson, British Columbia: 12 specimens. Taylor collection.

6 specimens. Cat. No. 196214, U.S.N.M.

Barkley Sound, British Columbia: 1 specimen. Can. Geol. Sur. collection.

Victoria, Vancouver Island, British Columbia: 1 specimen, type. Cat. No. 126660, U.S.N.M.

TURBONILLA (PYRGOLAMPROS) TAYLORI Dall and Bartsch.

Alert Bay, Queen Charlotte Island: 2 specimens. Cat. No. 196213, U.S.N.M.

4 specimens. Taylor collection.

Port Simpson, British Columbia: 1 specimen. Cat. No. 196211, U.S.N.M.

2 specimens. Taylor collection.

Carter Bay, British Columbia: 1 specimen, Taylor collection.

Banks Island, British Columbia: 8 specimens. Taylor collection.

3 specimens. Cat. No. 196212, U.S.N.M.

Departure Bay, British Columbia: 25 specimens. Taylor collection.

7 specimens (2=cotypes). Cat. No. 196210, U.S.N.M.

Barkley Sound, British Columbia: 4 specimens. Cat. No. 211572, U.S.N.M.

5 specimens. Cat. No. 211573, U.S.N.M.

15 specimens. Can. Geol. Sur. collection.

TURBONILLA (PYRGOLAMPROS) TALAMA Dall and Bartsch.

Barkley Sound, British Columbia: 1 specimen, type. Cat. No. 211537, U.S.N.M.

1 specimen. Collection of Can. Geol. Sur. Museum, Ottawa.

TURBONILLA (PYRGOLAMPROS) LOWEI Dall and Bartsch.

San Pedro, Cal.: 1 specimen. Cat. No. 159982, U.S.N.M.

1 specimen. Cat. No. 163257, U.S.N.M.

Off San Pedro, Cal.: 5 specimens (1=type). 10 fathoms. Cat. No. 152751a, U.S.N.M.

1 specimen. 4 fathoms. Cat. No. 204941, U.S.N.M.

Pacific Beach, Cal.: 1 specimen. Cat. No. 205948, U.S.N.M.

Off Point Loma, Cal.: U. S. B. F. station 4345, 25 fathoms, gray sand bottom. 1 specimen. Cat. No. 206864, U.S.N.M.

San Diego, Cal.: 1 specimen. Cat. No. 249621, U.S.N.M.

1 specimen. Gripp collection.

Off San Diego, Cal.: 1 specimen. 12 fathoms. Kelsey collection.

Outside of kelp, off San Diego Harbor, Cal.: 1 specimen. 16-20 fathoms. Gripp collection.

TURBONILLA (PYRGOLAMPROS) HALIBRECTA Dall and Bartsch.

Off Catalina Island, Cal.: 1 specimen, type. Cat. No. 205950, U.S.N.M.

TURBONILLA (PYRGOLAMPROS) GOULDI Dall and Bartsch.

Off Santa Rosa Island, Cal.: U. S. B. F. station 2900, 13 fathoms, sand bottom.

1 specimen. Cat. No. 163258, U.S.N.M.

San Pedro, Cal.: 1 specimen, cotype. Cat. No. 163256a, U.S.N.M.

1 specimen, cotype. Cat. No. 159990, U.S.N.M.

9 specimens. Cat. No. 163256, U.S.N.M.

12 specimens. Oldroyd collection.

Pacific Beach, Cal.: 1 specimen. Cat. No. 162561, U.S.N.M.

Off San Diego, Cal.: Univ. of Cal. station 59. 1 specimen. Univ. of Cal. collection.

TURBONILLA (PYRGOLAMPROS) AURANTIA Carpenter.

Departure Bay, British Columbia: 4 specimens. Taylor collection.

2 specimen. Cat. No. 196205, U.S.N.M.

Victoria, Vancouver Island, British Columbia: 3 specimens. Cat. No. 126660, U.S.N.M.

Puget Sound, Washington: 1 specimen. Cat. No. 44935, U.S.N.M.

TURBONILLA (PYRGOLAMPROS) PEDROANA Dall and Bartsch.

San Pedro, Cal.: 3 specimens. Cat. No. 163255, U.S.N.M.

Off San Pedro, Cal.: 4 specimens (1=type). 10 fathoms. Cat. No. 15275, U.S.N.M.

San Diego, Cal.: 1 specimen. Gripp collection.

9 miles off Point Loma Light, Cal.: U. S. B. F. station 4309, 67-78 fathoms, fine sand and shell bottom. 1 specimen. Cat. No. 206865, U.S.N.M.

Outside of kelp, off San Diego Harbor, Cal.: 1 specimen. 16-20 fathoms. Gripp collection.

TURBONILLA (PYRGOLAMPROS) HALIA Dall and Bartsch.

Santa Barbara, Cal.: 1 specimen. Berry collection.

Off San Pedro, Cal.: 1 specimen. 8 fathoms. Cat. No. 205946, U.S.N.M.

2 specimens. 10 fathoms. Cat. No. 205947, U.S.N.M.

San Diego, Cal.: 1 specimen, type. Cat. No. 59328, U.S.N.M.

2 specimens. Gripp collection.

TURBONILLA (PYRGOLAMPROS) LYALLI Dall and Bartsch.

Banks Island, British Columbia: 1 specimen, type. Cat. No. 196221, U.S.N.M.

TURBONILLA (PYRGOLAMPROS) BERRYI Dall and Bartsch.

2 miles off Santa Cruz Light, Monterey Bay, Cal.: U. S. B. F. station 4564, 9-10 fathoms, rocky bottom; bottom temperature 59°. 1 specimen. Cat. No. 196225, U.S.N.M.

Monterey Bay, Cal.: 1 specimen, type. 39 fathoms. Cat. No. 196223, U.S.N.M.

1 specimen. 39 fathoms. Berry collection.

Catalina Island, Cal.: 1 specimen. 52 fathoms. Cat. No. 196224, U.S.N.M.

TURBONILLA (PYRGOLAMPROS) ALASKANA Dall and Bartsch.

St. Paul, Kodiak, Alaska: 8 specimens (1=type). 13 fathoms. Cat. No. 160206, U.S.N.M.

Chagafka Cove, Kodiak, Alaska: Cat. No. 205149, U.S.N.M.

Granite Cove, Port Althorp, Alaska: 1 specimen. 8 fathoms. Cat. No. 205150, U.S.N.M.

Sitka Harbor, Alaska: 3 specimens. 12 fathoms. Cat. No. 160209, U.S.N.M.

TURBONILLA (PYRGOLAMPROS) CHOCOLATA Carpenter.

San Pedro, Cal.: 1 specimen, figured. Cat. No. 15315, U.S.N.M.

TURBONILLA (PYRGOLAMPROS) GLORIOSA Bartsch.

Outside San Diego, Cal.: 1 specimen, type. 12 fathoms. Cat. No. 211551, U.S.N.M.

TURBONILLA (PYRGOLAMPROS) PAINEI Dall and Bartsch.

Redondo, Cal.: 1 specimen, type. Cat. No. 205952, U.S.N.M.

Off Avalon, Catalina Island, Cal.: 1 specimen. 50 fathoms. Cat. No. 171911, U.S.N.M.

San Diego, Cal.: 1 specimen. Cat. No. 203507, U.S.N.M.

1 specimen. Cat. No. 249620, U.S.N.M.

Off Coronado Hotel, San Diego, Cal.: 1 specimen. 35 fathoms. Cat. No. 205953, U.S.N.M.

TURBONILLA (PYRGOLAMPROS) MACOUNI Dall and Bartsch.

Barkley Sound, British Columbia: 2 specimens (1=type). Cat. No. 211538. U.S.N.M.

? specimens. Can. Geol. Sur. Museum, Ottawa.

TURBONILLA (PYRGOLAMPROS) KEEPI Dall and Bartsch.

Long Beach, Cal.: 1 specimen, type. Cat. No. 173080, U.S.N.M.

Off Point Fermin, Cal.: Univ. of Cal. station 14 (?). ? specimens. Univ. of Cal. collection.

Off Catalina Island, Cal.: Univ. of Cal. station 21 (?). ? specimens. Univ. of Cal. collection.

Univ. of Cal. station 32. ? specimens. Univ. of Cal. collection.

Univ. of Cal. station 73. ? specimens. Univ. of Cal. collection.

TURBONILLA (PYRGOLAMPROS) HALISTREPTA Dall and Bartsch.

Off Newport, Cal.: 1 specimen, type. Cat. No. 205954, U.S.N.M.

2 specimens. Univ. of Cal. collection.

TURBONILLA (PYRGOLAMPROS) PESA Dall and Bartsch.

Barkley Sound, Vancouver Island, British Columbia: 1 specimen, type. Can. Geol. Sur. Museum, Ottawa.

TURBONILLA (PYRGOLAMPROS) RINELLA Dall and Bartsch.

Barkley Sound, Vancouver Island, British Columbia: 1 specimen, type. Can. Geol. Sur. Museum, Ottawa.

TURBONILLA (PYRGOLAMPROS) LITUYANA Dall and Bartsch.

Lituya Bay, Alaska: 1 specimen, type. Cat. No. 160208, U.S.N.M.

2 specimens. 8 fathoms. Cat. No. 160207, U.S.N.M.

TURBONILLA (PYRGOLAMPROS) OREGONENSIS Dall and Bartsch.

Off the coast of Washington: U. S. B. F. station 2868, 31 fathoms, gray sand bottom, bottom temperature 46.9°. 1 specimen. Cat. No. 196222, U.S.N.M.

Off Oregon: U. S. B. F. station 2885, 30 fathoms, fine gray sand bottom, bottom temperature 49°. 2 specimens (1=type). Cat. No. 181112, U.S.N.M.

TURBONILLA (PYRGISCUS) ANNETTAE Dall and Bartsch.

Off Manta, Ecuador: U. S. B. F. station 2792, 401 fathoms, green mud bottom, bottom temperature 42.9°. 2 specimens (1=type). Cat. No. 163265, U.S.N.M.

TURBONILLA (PYRGISCUS) GRACILLIMA Carpenter.

Mazatlan, Mexico: 2 specimens. Tablet 2001, Liverpool collection, British Museum.

TURBONILLA (PYRGISCUS) VEXATIVA Dall and Bartsch.

San Pedro, Cal.: 1 specimen, type. Cat. No. 160200, U.S.N.M.

Point Loma, Cal.: 3 specimens. Baker collection.

TURBONILLA (PYRGISCUS) OBESA Dall and Bartsch.

Pacific Beach, Cal.: 1 specimen, type. Cat. No. 162563, U.S.N.M.

TURBONILLA (PYRGISCUS) FAVILLA Dall and Bartsch.

Panama?: 1 specimen. Carpenter collection.

TURBONILLA (PYRGISCUS) PEQUENSIS Dall and Bartsch.

Off Lower California: U. S. B. F. station 2834, 48 fathoms, yellow mud bottom, bottom temperature 53.9°. 1 specimen, type. Cat. No. 97019, U.S.N.M.

TURBONILLA (PYRGISCUS) NUTTINGI Dall and Bartsch.

Off San Pedro, Cal.: 3 specimens. 8 fathoms. Cat. No. 152752, U.S.N.M.

White's Point, San Pedro, Cal.: 1 specimen. Oldroyd collection.

Southeast of Zuniga, Cal.: 1 specimen. 10 fathoms. Baker collection.

- Northwest of San Diego, Cal.: 2 specimens. 50 fathoms. Cat. No. 173075, U.S.N.M.
 San Diego Bay, Cal.: 1 specimen. 12-30 fathoms. Baker collection.
 San Diego, Cal.: 4 specimens. 20 fathoms. Kelsey collection.
 Univ. of Cal. station 28, 50 fathoms. 1 specimen. Kelsey collection.
 Univ. of Cal. station 28. 1 specimen. Univ. of Cal. collection.
 1 specimen. Gripp collection.
 Off San Diego, Cal.: 1 specimen, type. 20 fathoms. Cat. No. 160067, U.S.N.M.
 Outside of kelp, off San Diego Harbor, Cal.: 1 specimen. 16-20 fathoms. Gripp collection.
- TURBONILLA (PYRGISCUS) CALLIA** Dall and Bartsch.
 San Diego, Cal.: 1 specimen, type. Cat. No. 205936, U.S.N.M.
- TURBONILLA (PYRGISCUS) SUPERBA** Dall and Bartsch.
 Off La Paz, Gulf of California: U. S. B. F. station 2822, 21 fathoms, gray sand and broken shell bottom. 3 specimens (1=type). Cat. No. 163251, U.S.N.M.
- TURBONILLA (PYRGISCUS) PLUTO** Dall and Bartsch.
 San Pedro, Cal.: 1 specimen, type. 10 fathoms. Cat. No. 206866, U.S.N.M.
- TURBONILLA (PYRGISCUS) JEWETTI** Dall and Bartsch.
 San Pedro, Cal.: 2 specimens. Oldroyd collection.
 1 specimen. Lowe collection.
 Laguna Beach, Cal.: 34 specimens. Ball collection.
 15 specimens. Cat. No. 250235, U.S.N.M.
 Arch Beach, Cal.: 1 specimen. Univ. of Cal. collection.
 Pacific Beach, Cal.: 1 specimen. Cat. No. 162564, U.S.N.M.
 Ocean Beach, Cal.: 2 specimens. Cat. No. 152316, U.S.N.M.
 Terminal Island, Cal.: 1 specimen. Cat. No. 109519, U.S.N.M.
 San Diego, Cal.: 2 specimens (1=type). Cat. No. 153048, U.S.N.M.
 1 specimen. Cat. No. 163263, U.S.N.M.
 5 specimens. Kelsey collection.
 Todos Santos Bay, Lower California: 1 specimen. Cat. No. 46507, U.S.N.M.
 San Hipolito Point, Lower California: 4 specimens. Cat. No. 162565, U.S.N.M.
 Point Abrejos, Lower California: U. S. B. F. station 2835, 5½ fathoms, green mud bottom. 1 specimen. Cat. No. 162566, U.S.N.M.
- TURBONILLA (PYRGISCUS) SIGNAE** Dall and Bartsch.
 San Pedro, Cal.: 1 specimen, type. Cat. No. 160210, U.S.N.M.
- TURBONILLA (PYRGISCUS) STRIOSA** C. B. Adams.
 Panama: 1 specimen, type. Amherst College collection.
- TURBONILLA (PYRGISCUS) MORCHI** Dall and Bartsch.
 Near Redondo, Cal.: Univ. of Cal. station 122. 1 specimen. Univ. of Cal. collection.
 Long Beach, Cal.: 1 specimen, type. Cat. No. 173081, U.S.N.M.
 Off Catalina Island, Cal.: 1 specimen. 8 fathoms. Cat. No. 176622, U.S.N.M.
 San Diego, Cal.: 5 specimens. Cat. No. 196230, U.S.N.M.
 4 specimens. Lowe collection.
 Off San Diego, Cal.: Univ. of Cal. station 83. 1 specimen. Univ. of Cal. collection.
- TURBONILLA (PYRGISCUS) ARAGONI** Dall and Bartsch.
 Off New Monterey, Monterey Bay, Cal.: 1 specimen, type. 29 fathoms. Cat. No. 206867, U.S.N.M.
- TURBONILLA (PYRGISCUS) RECTA** Dall and Bartsch.
 San Diego, Cal.: 1 specimen. Cat. No. 162634, U.S.N.M.
 Point Abrejos, Lower California: 1 specimen, type. Cat. No. 162635, U.S.N.M.

TURBONILLA (PYRGISCUS) WELDI Dall and Bartsch.

Off Point Fermin, Cal.: Univ. of Cal. station 14. 1 specimen, type. Cat. No. 206868, U.S.N.M.

TURBONILLA (PYRGISCUS) NEREIA Dall and Bartsch.

San Pedro, Cal.: 1 specimen. Cat. No. 163260, U.S.N.M.

San Diego, Cal.: 1 specimen, type. Cat. No. 206869, U.S.N.M.

TURBONILLA (PYRGISCUS) ANTESTRIATA Dall and Bartsch.

Off Esteros Bay, Cal.: U. S. B. F. station 3194, 92 fathoms, gray sand bottom; bottom temperature 45.9°. 1 specimen, cotype. Cat. No. 168867, U.S.N.M.

Off Santa Rosa Island, Cal.: U. S. B. F. station 2902, 53 fathoms, fine gray sand and mud bottom; bottom temperature 45°. 3 specimens. Cat. No. 196233, U.S.N.M.

Near Redondo, Cal.: Univ. of Cal. station 122. 1 specimen. Univ. of Cal. collection.

Off Point Vincent, Cal.: Univ. of Cal. station 12. 1 specimen. Univ. of Cal. collection.

San Pedro, Cal.: 1 specimen, cotype. Cat. No. 196232, U.S.N.M.

2 specimens. 12 fathoms. Cat. No. 196231, U.S.N.M.

Off Catalina Island, Cal.: Univ. of Cal. station 30. 1 specimen. Univ. of Cal. collection.

Off San Diego, Cal.: Univ. of Cal. station 58. 2 specimens. Univ. of Cal. collection.

San Diego, Cal.: ? specimens. Gripp collection.

Zuniga, Cal.: 1 specimen. Baker collection.

TURBONILLA (PYRGISCUS) ANTEMUNDA Dall and Bartsch.

Santa Rosa Island, Cal.: U. S. B. F. station 2901, 48 fathoms, gray sand and mud bottom; bottom temperature 55.1°. 2 specimens, cotypes. Cat. No. 168866, U.S.N.M.

U. S. B. F. station 2902, 53 fathoms, fine gray sand and mud bottom; bottom temperature 45°. 20 specimens. Cat. No. 206872, U.S.N.M.

Off Catalina Island, Cal.: Univ. of Cal. station 32. 1 specimen. Univ. of Cal. collection.

TURBONILLA (PYRGISCUS) FLAVESCENS Carpenter.

Mazatlan, Mexico: 1 specimen. Tablet 2003, Havre collection, British Museum.

TURBONILLA (PYRGISCUS) MACBRIDEI Dall and Bartsch.

Off La Paz, Gulf of California: U. S. B. F. station 2826, 9½ fathoms, shell bottom. 1 specimen, type. Cat. No. 191563, U.S.N.M.

TURBONILLA (PYRGISCUS) MACRA Dall and Bartsch.

Point Abrejos, Lower California: 6 specimens (1=type). Cat. No. 162632, U.S.N.M.

TURBONILLA (PYRGISCUS) NUTTALLI Dall and Bartsch.

South America. 1 specimen, type. Cat. No. 56791, U.S.N.M. (Stearns coll.)

TURBONILLA (PYRGISCUS) ANGUSTA Carpenter.

Cape St. Lucas, Lower California: 1 specimen, type. Cat. No. 16212, U.S.N.M.

TURBONILLA (PYRGISCUS) TENUICULA Gould.

Monterey, Cal.: 2 specimens. Cat. No. 32245, U.S.N.M.

Santa Barbara, Cal.: 1 specimen.¹ Cat. No. 16267a, U.S.N.M.

Santa Barbara Islands, Cal.: 1 specimen. Cat. No. 162637, U.S.N.M.

¹ Figured.

- San Pedro, Cal.: 2 specimens. Cat. No. 151724, U.S.N.M.
 2 specimens. Cat. No. 152198, U.S.N.M.
 7 specimens. Cat. No. 191547, U.S.N.M.
 1 specimen. Cat. No. 160490, U.S.N.M.
 1 specimen. Cat. No. 196227, U.S.N.M.
 9 specimens. (Form *subcuspidata* Carpenter.) Oldroyd collection.
 6 specimens. (Form *crebrifilata* Carpenter.) Oldroyd collection.
 431 specimens. Oldroyd collection.
 (White's Point.) 275 specimens. Cat. No. 196226, U.S.N.M.
 (White's Point.) (Form *subcuspidata* Carpenter.) 1 specimen. Oldroyd collection.
 23 specimens. Kelsey collection.
- Laguna Beach, Cal.: 134 specimens. Ball collection.
 20 specimens. Cat. No. 250236, U.S.N.M.
 3 specimens. Hemphill collection.
 1 specimen. Gripp collection.
- Arch Beach, Newport Bay, Cal.: 6 specimens. Univ. of Cal. collection.
- Off Catalina Island, Cal.: 1 specimen. Cat. No. 206873, U.S.N.M.
 1 specimen. Univ. of Cal. collection.
- Pacific Beach, Cal.: 1 specimen. Oldroyd collection.
 1 specimen. Cat. No. 192228, U.S.N.M.
- Ocean Beach, San Diego, Cal.: 2 specimens. Cat. No. 122318, U.S.N.M.
 7 specimens. Cat. No. 153065, U.S.N.M.
- Ballast Point, San Diego, Cal.: 1 specimen. Kelsey collection.
- San Diego, Cal.: 1 specimen. Kelsey collection.
 3 specimens. Cat. No. 46504, U.S.N.M.
 5 specimens. Cat. No. 160481, U.S.N.M.
 1 specimen.¹ Cat. No. 14829, U.S.N.M.
 1 specimen. Cat. No. 206875, U.S.N.M.
 2 specimens. Cat. No. 60933, U.S.N.M.
 1 specimen. Cat. No. 157204a, U.S.N.M.
 9 specimens. Univ. of Cal. collection.
 7 specimens. Oldroyd collection.
- Off South Coronado Island, Cal.: 9 specimens. 3 fathoms. Baker collection.
- Todos Santos Bay, Lower California: 7 specimens.² Cat. No. 32284, U.S.N.M.
- Point Abrejos, Lower California: 1 specimen. Cat. No. 105585, U.S.N.M.
 2 specimens. Cat. No. 106510, U.S.N.M.
- TURBONILLA (PYRGISCUS) CALLIMENE** Bartsch.
 San Diego Bay, Cal.: 1 specimen, type. Cat. No. 211554, U.S.N.M.
- TURBONILLA (PYRGISCUS) VIRGO** Carpenter.
 Santa Barbara, Cal.: 1 specimen, type. Cat. No. 73993, U.S.N.M.
- TURBONILLA (PYRGISCUS) MARSHALLI** Dall and Bartsch.
 Off La Paz, Gulf of California: U.S.B.F. station 2822, 21 fathoms, gray sand and broken shell bottom. 2 specimens (1=type). Cat. No. 163262, U.S.N.M.
- TURBONILLA (PYRGISCUS) CANFIELDI** Dall and Bartsch.
 Off Del Monte, Monterey, Cal.: 1 specimen, type. 12 fathoms. Cat. No. 196229, U.S.N.M.

¹ Figured type of *Turbonilla tenuicula subcuspidata*.² Figured *crebrifilata*.

TURBONILLA (PYRGISCUS) ALMO Dall and Bartsch.

Off San Diego, Cal.: 4 specimens (1=type). 2 fathoms. Cat. No. 162633, U.S.N.M.

TURBONILLA (PYRGISCUS) CALLIPEPLUM Dall and Bartsch.

Panama Bay: U. S. B. F. station 2805, 51½ fathoms, green mud bottom. 1 specimen, type. Cat. No. 122797, U.S.N.M.

TURBONILLA (PYRGISCUS) DINA Dall and Bartsch.

Panama Bay: U. S. B. F. station 2799, 29½ fathoms, green mud bottom. 2 specimens (1=type). Cat. No. 162428, U.S.N.M.

TURBONILLA (PYRGISCUS) SHIMEKI Dall and Bartsch.

Off Galapagos Islands, South America: U. S. B. F. station 2813, 40 fathoms, coral and sand bottom. 2 specimens (1=type). Cat. No. 206877, U.S.N.M.

TURBONILLA (PYRGISCUS) SANCTORUM Dall and Bartsch.

Off Ceralvo Island, Gulf of California: U. S. B. F. station 2827, 10 fathoms, shell bottom. 4 specimens. Cat. No. 162516, U.S.N.M.

Off La Paz, Gulf of California: U. S. B. F. station 2823, 26½ fathoms, broken shell bottom. 21 specimens (1=type). Cat. No. 162514, U.S.N.M.

TURBONILLA (PYRGISCUS) EUCOSMOBASIS Dall and Bartsch.

San Luis Obispo Bay, Cal.: U. S. B. F. station 3195, 252 fathoms, green mud bottom, bottom temperature 43.2°. 1 specimen. Cat. No. 162680, U.S.N.M.

Off Santa Rosa Island, Cal.: U. S. B. F. station 2901, 48 fathoms, gray sand and mud bottom, bottom temperature 55.1°. 4 specimens. Cat. No. 162681, U.S.N.M.

Off Santa Barbara, Cal.: U. S. B. F. station 2902, 53 fathoms, fine gray sand and mud bottom, bottom temperature 45°. 1 specimen, type. Cat. No. 162679, U.S.N.M.

Off Catalina Island, Cal.: Univ. of Cal. station 32. 1 specimen. Univ. of Cal. collection.

Off San Diego, Cal.: Univ. of Cal. station 59. 2 specimens. Univ. of Cal. collection.

TURBONILLA (PYRGISCUS) HALIDOMA Dall and Bartsch.

Off La Paz, Gulf of California: U. S. B. F. station 2822, 21 fathoms, gray sand and broken shell bottom. 1 specimen, type. Cat. No. 162693, U.S.N.M.

TURBONILLA (PYRGISCUS) AURICOMA Dall and Bartsch.

San Pedro, Cal.: 2 specimens. Oldroyd collection.
4 specimens. Oldroyd collection.

San Diego, Cal.: 1 specimen. Cat. No. 73997, U.S.N.M.

Outside of kelp, off San Diego Harbor, Cal.: 1 specimen. 16-20 fathoms. Gripp collection.

Scammon Lagoon, Lower California: 4 specimens (1=type). Cat. No. 106511, U.S.N.M.

2 specimens. Arnold collection.

2 specimens. Kelsey collection.

TURBONILLA (PYRGISCUS) CASTANEA Keep.

San Pedro, Cal.: 1 specimen. Oldroyd collection.

1 specimen. Cat. No. 160224, U.S.N.M.

Ocean Beach, Cal.: 2 specimens. Kelsey collection.

San Diego, Cal.: 1 specimen, type. Keep collection.

U. S. B. F. station 3566, 3 fathoms, fine sand and black shell bottom. 1 specimen. Cat. No. 162682, U.S.N.M.

U. S. B. F. station 3573, 1½ fathoms, mud and sand bottom. 1 specimen. Cat. No. 163264, U.S.N.M.

2 specimens. Arnold collection.

San Diego Bay, Cal.: 2 specimens. Kelsey collection.
 Sandspit, San Diego, Cal.: 1 specimen. Cook collection.

TURBONILLA (PYRGISCUS) CASTANELLA Dall.

Monterey, Cal.: 1 specimen, type. Cat. No. 74000, U.S.N.M.

TURBONILLA (PYRGISCUS) GRIPPI Bartsch.

Off San Diego, Cal.: 1 specimen, type. Cat. No. 229011, U.S.N.M.

TURBONILLA (PYRGISCUS) INDENTATA Carpenter.

Mazatlan, Mexico: 1 specimen. Tablet 1986, Liverpool collection, British Museum.

TURBONILLA (PYRGISCUS) CORA D'Orbigny.

Coast of Peru, near Payta: 1 specimen, type. British Museum.

TURBONILLA (PYRGISCUS) CRATICULATA Mörch.

Los Bocorones, a small island near Punta Arenas, Costa Rica: 3 specimens. 30 fathoms. University Museum, Copenhagen, Denmark.

TURBONILLA (PYRGISCUS) CERALVA Dall and Bartsch.

Off Cerralvo Island, Gulf of California: U. S. B. F. station 2826, 9½ fathoms, shell bottom. 1 specimen. Cat. No. 206878, U.S.N.M.

Off La Paz, Lower California: U. S. B. F. station 2823, 26½ fathoms, broken-shell bottom. 1 specimen, type. Cat. No. 162685, U.S.N.M.

TURBONILLA (PYRGISCUS) LEPTA Dall and Bartsch.

Off La Paz, Gulf of California: U. S. B. F. station 2823, 26½ fathoms, broken-shell bottom. 1 specimen, type. Cat. No. 162584, U.S.N.M.

TURBONILLA (PYRGISCUS) HISTIAS Dall and Bartsch.

Off La Paz, Gulf of California: U. S. B. F. station 2822, 21 fathoms, gray sand and broken-shell bottom. 3 specimens (1=type). Cat. No. 162636, U.S.N.M.

TURBONILLA (PYRGISCUS) SUBULA Mörch.

Los Bocorones, small islands near Punta Arenas, Costa Rica. 1 specimen. 30 fathoms. University Museum, Copenhagen, Denmark.

TURBONILLA (PYRGISCUS) WICKHAMI Dall and Bartsch.

Off Santa Catalina Island, Cal.: Univ. of Cal. station 32. 4 specimens (1=type). Cat. No. 206879, U.S.N.M.

TURBONILLA (PYRGISCUS) LARA Dall and Bartsch.

Off La Paz, Gulf of California: U. S. B. F. station 2823, 26½ fathoms, broken-shell bottom. 67 specimens (1=type). Cat. No. 96707, U.S.N.M.

Off Cerralvo Island, Gulf of California: U. S. B. F. station 2822, 21 fathoms, gray sand and broken-shell bottom. 8 specimens. Cat. No. 162683, U.S.N.M.

U. S. B. F. stations 2826-2828, 9½ to 10 fathoms, shell bottom. 5 specimens. Cat. No. 191564, U.S.N.M.

U. S. B. F. stations 2826-2828, 9½ to 10 fathoms, shell bottom. 31 specimens. Cat. No. 151929, U.S.N.M.

TURBONILLA (PYRGISCUS) CINCTELLA Mörch.

Sonsonate, Guatemala, Central America: 1 specimen, type. University Museum, Copenhagen, Denmark.

TURBONILLA (PYRGISCUS) ADUSTA Dall and Bartsch.

San Diego, Cal.: 1 specimen, type. Cat. No. 206880, U.S.N.M.

TURBONILLA (PYRGISCUS) LARUNDA Dall and Bartsch.

Off La Paz, Gulf of California: U. S. B. F. station 2822, 21 fathoms, gray sand and broken-shell bottom. 3 specimens (2=cotypes). Cat. No. 206881, U.S.N.M.

TURBONILLA (MORMULA) LORDI E. A. Smith.

Sitka Harbor, Alaska: 1 specimen, 12 fathoms. Cat. No. 160492, U.S.N.M.

7 specimens. Cat. No. 160069, U.S.N.M.

Banks Island, British Columbia: 1 specimen. Cat. No. 196234, U.S.N.M.

6 specimens. Taylor collection.

Puget Sound, Wash.: 1 specimen. Cat. No. 4480, U.S.N.M.

Port Orchard, Wash.: 2 specimens. Cat. No. 133234, U.S.N.M.

TURBONILLA (MORMULA) REGINA Dall and Bartsch.

Off Santa Rosa Island, Cal.: U. S. B. F. station 2902, 15 fathoms, fine gray sand and mud bottom; bottom temperature, 45°. 1 specimen, type. Cat. No. 162686, U.S.N.M.

U. S. B. F. station 2901, 48 fathoms, gray sand and mud bottom; bottom temperature, 55.1°. 1 specimen. Cat. No. 162687, U.S.N.M.

Off Point Fermin, Cal.: Univ. of Cal. station 14°. 1 specimen. Univ. of Cal. collection.

Catalina Island, Cal.: 1 specimen. Cat. No. 160119, U.S.N.M.

Off Catalina Island, Cal.: Univ. of Cal. station 21° (3). 1 specimen. Univ. of Cal. collection.

Univ. of Cal. station 32°. 1 specimen. Univ. of Cal. collection.

TURBONILLA (MORMULA) CATALINENSIS Dall and Bartsch.

Off Catalina Island, Cal.: 2 specimens (1=type). Cat. No. 160147, U.S.N.M.

Univ. of Cal. station 21 (3). 1 specimen. Univ. of Cal. collection.

TURBONILLA (MORMULA) ESCHSCHOLTZI Dall and Bartsch.

Port Simpson, British Columbia: 10 specimens. Taylor collection.

5 specimens. Cat. No. 196243, U.S.N.M.

West of Ross Spit, Dixon Entrance, Queen Charlotte Islands, British Columbia: 1 specimen. Taylor collection.

Carter Bay, British Columbia: 1 specimen, type. Cat. No. 196241, U.S.N.M.
1 specimen. Taylor collection.

Departure Bay, British Columbia: 5 specimens. Taylor collection.

1 specimen. Cat. No. 196242, U.S.N.M.

Barkley Sound, British Columbia: 35 specimens. Cat. No. 211574, U.S.N.M.
36 specimens. Can. Geol. Sur. collection.

TURBONILLA (MORMULA) TRIDENTATA Carpenter.

Monterey, Cal.: 1 specimen, type. Cat. No. 153156, U.S.N.M.

Monterey Bay, Cal.: 1 specimen. 39 fathoms. Berry collection.

Off Santa Rosa Island, Cal.: U. S. B. F. station 2902, 53 fathoms, fine gray sand and mud bottom; bottom temperature 45°. 4 specimens. Cat. No. 126239, U.S.N.M.

San Pedro, Cal.: 10 specimens. Cat. No. 196240, U.S.N.M.

9 specimens. Oldroyd collection.

(White's Point.) 2 specimens. Oldroyd collection.

? specimens. Lowe collection.

3 specimens (1=figured). 4 fathoms. Cat. No. 150983, U.S.N.M.

Laguna Beach, Cal.: 2 specimens. Ball collection.

Off Catalina Island, Cal.: 1 specimen. Univ. of Cal. collection.

Ocean Beach, Cal.: 1 specimen. Kelsey collection.

San Diego, Cal.: 2 specimens. Cat. No. 46505, U.S.N.M.

(Foot of Ash St.) 2 specimens. Oldroyd collection.

1 specimen. Oldroyd collection.

2 specimens. Arnold collection.

2 specimens. Kelsey collection.

(Off hotel.) 1 specimen. Kelsey collection.

TURBONILLA (MORMULA) AMBUSTA Dall and Bartsch.

- Off San Pedro, Cal.: 1 specimen, type. 10 fathoms. Cat. No. 152751, U.S.N.M.
 1 specimen. Lowe collection.
 1 specimen. Oldroyd collection.
 San Diego, Cal.: 1 specimen. Gripp collection.

TURBONILLA (MORMULA) SCAMMONENSIS Bartsch.

- Scammon Lagoon, Lower California: 1 specimen, figured. Cat. No. 211552, U.S.N.M.
 1 specimen. Kelsey collection.

TURBONILLA (MORMULA) MAJOR C. B. Adams.

- Panama: 1 specimen. Cat. No. 225, Amherst College collection.

TURBONILLA (MORMULA) SANTOSANA Dall and Bartsch.

- Off Todos Santos, Lower California: U. S. B. F. station 2830, 66 fathoms, fine sand bottom; bottom temperature 74.1°. 1 specimen, type. Cat. No. 162689, U.S.N.M.

TURBONILLA (MORMULA) PENTALOPHA Dall and Bartsch.

- San Pedro Bay, Cal.: 4 specimens. Oldroyd collection.
 San Pedro, Cal.: 4 specimens. Oldroyd collection.
 1 specimen. Cat. No. 206885, U.S.N.M.
 San Diego, Cal.: 36 specimens (1=type). Cat. No. 46501, U.S.N.M. 5 specimens. Cat. No. 59328, U.S.N.M.
 U. S. B. F. station 3564, 5 fathoms, fine sand, mud and black shell bottom. 1 specimen. Cat. No. 206882, U.S.N.M.
 U. S. B. F. station 3566, 3 fathoms, fine sand and black shell bottom. 3 specimens. Cat. No. 206883, U.S.N.M. (Off Hotel.) 4 specimens. 12 fathoms. Kelsey collection.
 Southern California: 1 specimen. Cat. No. 206884, U.S.N.M.
 Todos Santos Bay, Lower California: 1 specimen. Cat. No. 32284, U.S.N.M.

TURBONILLA (MORMULA) HETEROLOPHA Dall and Bartsch.

- Ocean Beach, Cal.: 1 specimen. Kelsey collection.
 San Diego, Cal.: 4 specimens (1=type). Cat. No. 153065, U.S.N.M.
 1 specimen. 12 fathoms. Cat. No. 206886, U.S.N.M.
 San Hipolito Point, Cal.: 4 specimens. Cat. No. 192690, U.S.N.M.
 5 specimens. Hemphill collection.

TURBONILLA (MORMULA) IGNACIA Dall and Bartsch.

- San Ignacio Lagoon, Lower California: 3 specimens (1=type). Cat. No. 162691, U.S.N.M.

TURBONILLA (MORMULA) PERISCELIDA Dall and Bartsch.

- Off Santa Rosa Island, Cal.: U. S. B. F. station 2901, 48 fathoms, gray sand and mud bottom; bottom temperature 55.1°. 3 specimens (1=type). Cat. No. 163266, U.S.N.M.

TURBONILLA (MORMULA) PHALERA Dall and Bartsch.

- Panama Bay: U. S. B. F. station 2794, 62 fathoms, gray sand, black specks and broken shell bottom; bottom temperature 59.6°. 1 specimen, type. Cat. No. 163267, U.S.N.M.

TURBONILLA (DUNKERIA) SEDILLINA Dall and Bartsch.

- Off Cerralvo Island, Gulf of California: U. S. B. F. station 2826, 9½ fathoms, shell bottom. 1 specimen. Cat. No. 206888, U.S.N.M.
 Off La Paz, Gulf of California: U. S. B. F. station 2823, 26½ fathoms, broken shell bottom. 10 specimens (1=type). Cat. No. 162697 U.S.N.M.
 U. S. B. F. station 2822, 21 fathoms, gray sand and broken shell bottom. 1 specimen. Cat. No. 206887, U.S.N.M.

TURBONILLA (DUNKERIA) LAMINATA Carpenter.

- San Pedro, Cal.: 3 specimens. Cat. No. 14946, U.S.N.M.
3 specimens. Cat. No. 130564, U.S.N.M.
34 specimens. Cat. No. 208465, U.S.N.M.
1 specimen, described and figured. Cat. No. 9466, U.S.N.M.
62 specimens. Oldroyd collection.
? specimens. Roper collection.
? specimens. Lowe collection.
- Terminal Island, Cal.: ? specimens. Eahnaur collection.
- Off Catalina Island, Cal.: Univ. of Cal. station 32. 1 specimen. Univ. of Cal. collection.
- Ocean Beach, Cal.: 7 specimens. Cat. No. 153049, U.S.N.M.
1 specimen. Cat. No. 152315, U.S.N.M.
- Off Ballast Point, San Diego, Cal.: 3 specimens. 12-15 fathoms. Cat. No. 160111, U.S.N.M.
16 specimens. Kelsey collection.
- San Diego, Cal.: 5 specimens. Kelsey collection.
2 specimens. Cat. No. 152317, U.S.N.M.
2 specimens. Cat. No. 109366, U.S.N.M.
2 specimens. Arnold collection.
2 specimens. Lowe collection.
U. S. B. F. station 3566, 3 fathoms, fine sand and black shell bottom. 1 specimen. Cat. No. 206891, U.S.N.M.
(Foot of Ash St.) 4 specimens. Oldroyd collection.
- San Diego Harbor, Cal.: 2 specimens. Cat. No. 211111, U.S.N.M.
- White's Point, San Diego, Cal.: 1 specimen. Oldroyd collection.
- Off San Diego, Cal.: Univ. of Cal. station 37. 1 specimen. Univ. of Cal. collection.
- Outside of kelp, off San Diego Harbor, Cal.: 1 specimen. 16-20 fathoms. Gripp collection.
- Todos Santos Bay, Lower California: 1 specimen. Cat. No. 322845, U.S.N.M.
- Point Abrejos, Lower California: 5 specimens. Cat. No. 106517, U.S.N.M.

TURBONILLA (DUNKERIA) HIPOLITENSIS Dall and Bartsch.

- San Hipolito Point, Lower California: 3 specimens (1=type). Cat. No. 206889, U.S.N.M.

TURBONILLA (DUNKERIA) EXCOLPA Dall and Bartsch.

- Gulf of California: 1 specimen, type. Cat. No. 206892, U.S.N.M.

TURBONILLA (DUNKERIA) SUBANGULATA Carpenter.

- Mazatlan, Mexico: 2 specimens. Tablet 2008, Liverpool collection, British Museum.

TURBONILLA (DUNKERIA) ANDREWSI Dall and Bartsch.

- Panama: 1 specimen, type. Cat. No. 162969, U.S.N.M.
3 specimens. Amherst collection.

TURBONILLA (DUNKERIA) ARATA Dall and Bartsch.

- Off Santa Catalina Island, Cal.: 1 specimen, type. Cat. No. 206890, U.S.N.M.

TURBONILLA (DUNKERIA) GENILDA Dall and Bartsch.

- Panama Bay: U.S.B.F. station 2799, 29½ fathoms, green mud bottom. 1 specimen, type. Cat. No. 96806, U.S.N.M.
U.S.B.F. station 2799, 29½ fathoms, green mud bottom. 3 specimens. Cat. No. 162694, U.S.N.M.

TURBONILLA (PYRGISCULUS) MONILIFERA Dall and Bartsch.

- Gulf of California: 1 specimen, type. Cat. No. 58334, U.S.N.M.

TURBONILLA (PYRGISCULUS) CANCELLATA Carpenter.

Mazatlan, Mexico: 1 specimen, type. Tablet 2009, Liverpool collection, British Museum.

TURBONILLA (PYRGISCULUS) FESTIVA De Folin.

Bay of Panama: 1 specimen, type. De Folin collection.

TURBONILLA (PYRGISCULUS) EUCOSMIA Dall and Bartsch.

Off Cerralvo Island, Gulf of California: U.S.B.F. station 2827, 10 fathoms, shell bottom. 2 specimens. Cat. No. 163251a, U.S.N.M.

Off La Paz, Gulf of California: U.S.B.F. station 2822, 21 fathoms, gray sand and broken shell bottom. 1 specimen, type. Cat. No. 162698, U.S.N.M.

TURBONILLA (PYRGISCULUS) SWANI Dall and Bartsch.

San Pedro, Cal.: 1 specimen, type. Cat. No. 160485, U.S.N.M.

TURBONILLA (PYRGISCULUS) PAUCILIRATA Carpenter.

Mazatlan, Mexico: 1 specimen, type. Tablet 2007, Liverpool collection, British Museum.

TURBONILLA (ASMUNDA) TURRITA C. B. Adams.

Panama: 2 specimens, cotypes. Cat. No. 230, Amherst College collection.
1 specimen. Cat. No. 251, U.S.N.M.

TURBONILLA (CARELIOPSIS) STENOGYRA Dall and Bartsch.

San Hipolito Point, Lower California: 2 specimens (1=type). Cat. No. 162699, U.S.N.M.

ODOSTOMIA (LYSACME) CLAUSILIFORMIS Carpenter.

Mazatlan, Mexico: 1 specimen. Tablet 1987, Liverpool collection, British Museum.

ODOSTOMIA (SALASSIELLA) LAXA Dall and Bartsch.

Pacific Beach, Cal.: 1 specimen. Kelsey collection.

San Diego, Cal.: 1 specimen. Cat. No. 286893, U.S.N.M.

Scammon Lagoon, Lower California: 2 specimens. Cat. No. 106512, U.S.N.M.

ODOSTOMIA (SALASSIELLA) RICHI Dall and Bartsch.

San Pedro, Cal.: 1 specimen, type. Cat. No. 160484, U.S.N.M.

ODOSTOMIA (SALASSIA) TROPIDITA Dall and Bartsch.

Ile of Pearls, Bay of Panama: 1 specimen, type. De Folin collection.

ODOSTOMIA (SALASSIA) SCALARIFORMIS Carpenter.

Mazatlan, Mexico: 1 specimen. Tablet 1962, Liverpool collection, British Museum.

ODOSTOMIA (BESLA) CONVEKA Carpenter.

Off Cacachitas, Gulf of California: U.S.B.F. station 2823, 26½ fathoms, broken shell bottom. 2 specimens. Cat. No. 162734, U.S.N.M.

Mazatlan, Mexico. 2 specimens (1=type). Tablet 1984, Liverpool collection, British Museum.

ODOSTOMIA (BESLA) EXCOLPA Bartsch.

Gulf of California: 1 specimen, type. Cat. No. 198903a, U.S.N.M.

ODOSTOMIA (BESLA) CALLIMORPHA Dall and Bartsch.

San Pedro, Cal.: 1 specimen, type. Cat. No. 15565, U.S.N.M.

ODOSTOMIA (CHRYSAEIDA) HETEROCINCTA Bartsch.

Off San Diego, Cal.: U.S.B.F. station 2932, 20 fathoms, gray sand and broken shell bottom; bottom temperature 58°. 1 specimen, type. Cat. No. 212033, U.S.N.M.

ODOSTOMIA (CHRYSAEIDA) REIGENI Carpenter.

Mazatlan, Mexico: 1 specimen, type. Tablet 1979, Liverpool collection, British Museum.

ODOSTOMIA (CHRYSTALLIDA) INCONSPICUA C. B. Adams.

Panama Bay: 1 specimen, type. Amherst College collection.

ODOSTOMIA (CHRYSTALLIDA) TELESCOPIUM Carpenter.

Mazatlan, Mexico: 3 specimens. Tablet 1978, Liverpool collection, British Museum.

ODOSTOMIA (CHRYSTALLIDA) EXCELSA Dall and Bartsch.

Bay of Panama: 1 specimen, type. Cat. No. 206894, U.S.N.M.

ODOSTOMIA (CHRYSTALLIDA) ACRYBIA Dall and Bartsch.

Point Abrejos, Lower California: 1 specimen, type. Cat. No. 206895, U.S.N.M.

ODOSTOMIA (CHRYSTALLIDA) COMMUNIS C. B. Adams.

Bay of Panama: 15 specimens. Amherst College collection.

ODOSTOMIA (CHRYSTALLIDA) TORRITA Dall and Bartsch.

Mazatlan, Mexico: 5 specimens (1=type). Amherst College collection.

ODOSTOMIA (CHRYSTALLIDA) LICINA Dall and Bartsch.

Manuel Lagoon, Lower California: 2 specimens (1=type). Cat. No. 106500, U.S.N.M.

ODOSTOMIA (CHRYSTALLIDA) TALAMA Dall and Bartsch.

Scammon Lagoon, Lower California: 4 specimens (1=type). Cat. No. 106518, U.S.N.M.

ODOSTOMIA (CHRYSTALLIDA) EFFUSA Carpenter.

Cape St. Lucas, Lower California: 1 specimen. Cat. No. 16194, U.S.N.M.

Mazatlan, Mexico: 1 specimen, type. Tablet 1980, Liverpool collection, British Museum.

ODOSTOMIA (CHRYSTALLIDA) PAUPERCUA C. B. Adams.

Bay of Panama: 1 specimen, type. Amherst College collection.

ODOSTOMIA (CHRYSTALLIDA) CLATHERATULA C. B. Adams.

Bay of Panama: 2 specimens. Amherst College collection.
8 specimens. ? collection.

ODOSTOMIA (CHRYSTALLIDA) RITTERI Dall and Bartsch.

Off Catalina Island Cal.: Univ. of Cal. station 30. 1 specimen, type. Cat. No. 206896, U.S.N.M.

Univ. of Cal. station 30. 4 specimens. Univ. of Cal. collection.

1 specimen, 50 fathoms. Cat. No. 206897, U.S.N.M.

Off San Diego, Cal.: Univ. of Cal. station 47. 4 specimens. Univ. of Cal. collection.

Univ. of Cal. station 59. 3 specimens. Univ. of Cal. collection.

Univ. of Cal. station 83. 3 specimens. Univ. of Cal. collection.

San Diego, Cal.: 2 specimens. Kelsey collection.

San Pedro, Cal.: 8 specimens. Baldrige collection.

ODOSTOMIA (CHRYSTALLIDA) RINELLA Dall and Bartsch.

Bay of Panama: 1 specimen, type. Cat. No. 162781, U.S.N.M.

ODOSTOMIA (CHRYSTALLIDA) EUGENA Dall and Bartsch.

San Pedro, Cal.: 1 specimen. Cat. No. 168566, U.S.N.M.

2 specimens. Berry collection.

South Coronado Island, Cal.: 1 specimen. 3 fathoms. Kelsey collection.

San Diego, Cal.: 1 specimen. Cat. No. 168567, U.S.N.M.

(Foot of Ash St.) 1 specimen. Oldroyd collection.

San Hipolito Point, Lower California: 4 specimens (1=type). Cat. No. 127545, U.S.N.M.

ODOSTOMIA (CHRYSTALLIDA) TRACHIS Dall and Bartsch.

San Pedro, Cal.: 1 specimen, type. Cat. No. 168619, U.S.N.M.

ODOSTOMIA (CHRYSTALLIDA) LUCCA Dall and Bartsch.

Monterey, Cal.: 1 specimen. Kelsey collection.

Off Santa Catalina Island, Cal.: 1 specimen. Univ. of Cal. collection.

Off San Diego, Cal.: Univ. of Cal. station 47. 4 specimens. Univ. of Cal. collection.

San Diego, Cal.: 1 specimen, type. Cat. No. 206898, U.S.N.M.

ODOSTOMIA (CHRYSTALLIDA) CLEMENTINA Dall and Bartsch.

San Clemente Island, Cal.: 1 specimen, type. Cat. No. 162043, U.S.N.M.

ODOSTOMIA (CHRYSTALLIDA) OONISCA Dall and Bartsch.

Mazatlan, Mexico: 9 specimens. Tablet 1982, Liverpool collection, British Museum.

ODOSTOMIA (CHRYSTALLIDA) OLDROYDI Dall and Bartsch.

San Pedro, Cal.: (White's Point.) 1 specimen. Cat. No. 162766, U.S.N.M.

San Diego, Cal.: 1 specimen, type. Cat. No. 162765, U.S.N.M.

Off Los Coronados Islands: U. S. B. F. station 2932, 20 fathoms, gray sand and broken shell bottom; bottom temperature 58°. 1 specimen. Cat. No. 168569, U.S.N.M.

ODOSTOMIA (CHRYSTALLIDA) NODOSA Carpenter.

Mazatlan, Mexico: 2 specimens. Tablet 1969, Liverpool collection, British Museum.

ODOSTOMIA (CHRYSTALLIDA) OVATA Carpenter.

Mazatlan, Mexico: 3 specimens. Tablet 1968, Liverpool collection. British Museum.

ODOSTOMIA (CHRYSTALLIDA) CINCTA Carpenter.

San Pedro, Cal.: 1 specimen. Cat. No. 162768, U.S.N.M.

Santa Barbara, Cal.: 1 specimen, type. Cat. No. 15730, U.S.N.M.

Pacific Beach, Cal.: 1 specimen. Cat. No. 162769, U.S.N.M.

ODOSTOMIA (CHRYSTALLIDA) LOOMISI Dall and Bartsch.

Bay of Panama: 6 specimens (1=type). Amherst College collection.

ODOSTOMIA (CHRYSTALLIDA) VICOLA Dall and Bartsch.

San Pedro Bay, Cal.: 1 specimen, type. Cat. No. 206899, U.S.N.M.

ODOSTOMIA (CHRYSTALLIDA) ASTRICATA Dall and Bartsch.

Monterey, Cal.: 1 specimen, type. Cat. No. 196280, U.S.N.M.

ODOSTOMIA (CHRYSTALLIDA) COOPERI Dall and Bartsch.

Monterey, Cal.: 1 specimen, type. Cat. No. 162771, U.S.N.M.

ODOSTOMIA (CHRYSTALLIDA) HIPOLITENSIS Dall and Bartsch.

San Hipolito Point, Lower California: 1 specimen, type. Cat. No. 162770, U.S.N.M.

ODOSTOMIA (CHRYSTALLIDA) LAPAZANA Dall and Bartsch.

Off La Paz, Lower California: U. S. B. F. station 2823, 26½ fathoms, broken shell bottom. 3 specimens (1=type). Cat. No. 162778, U.S.N.M.

ODOSTOMIA (CHRYSTALLIDA) PROXIMA De Folin.

Margarita Island, Bay of Panama: 1 specimen, type. De Folin collection.

ODOSTOMIA (CHRYSTALLIDA) TYLERI Dall and Bartsch.

Bay of Panama: 6 specimens (1=type). Amherst College collection.

ODOSTOMIA (CHRYSTALLIDA) SCAMMONENSIS Dall and Bartsch.

Scammon Lagoon, Lower California: 1 specimen, type. Cat. No. 106518, U.S.N.M.

San Hipolito Point, Lower California: 4 specimens. Cat. No. 162770, U.S.N.M.

Point Abrejos, Lower California: 8 specimens. Cat. No. 162780, U.S.N.M.

ODOSTOMIA (CHRYSTALLIDA) PULCHRA De Folin.

Margarita Island, Bay of Panama: 1 specimen, type. De Folin collection.

ODOSTOMIA (CHRYSTALLIDA) MONTEREYENSIS Dall and Bartsch.

Del Monte, Monterey Bay, Cal.: 1 specimen, type. Cat. No. 196281, U.S.N.M.

3 specimens. Berry collection.

Monterey, Cal.: 1 specimen. Cat. No. 74003, U.S.N.M.

1 specimen. Cat. No. 196282, U.S.N.M.

1 specimen. Oldroyd collection.

1 specimen. Kelsey collection.

San Luis Obispo, Cal.: 1 specimen. Cat. No. 162767, U.S.N.M.

ODOSTOMIA (CHRYSTALLIDA) PULCIA Dall and Bartsch.

Monterey, Cal.: 1 specimen. Kelsey collection.

San Luis Obispo, Cal.: 1 specimen. Oldroyd collection.

Terminal Island, Cal.: 2 specimens. Eshnaur collection.

San Pedro, Cal.: 36 specimens (1=type). Cat. No. 162763, U.S.N.M.

70 specimens. Oldroyd collection.

37 specimens. Cat. No. 163568, U.S.N.M.

2 specimens (1 young). Baldrige collection.

ODOSTOMIA (CHRYSTALLIDA) VIRGINALIS Dall and Bartsch.

White's Point. San Pedro, Cal.: 4 specimens. Oldroyd collection.

48 specimens. Cat. No. 158570, U.S.N.M.

10 specimens. Oldroyd collection.

San Pedro, Cal.: 47 specimens. Oldroyd collection.

2 specimens. Baldrige collection.

Arch Beach, San Diego, Cal.: 1 specimen. Univ. of Cal. collection.

San Diego, Cal.: 10 specimens. Kelsey collection.

Todos Santos Bay, Lower California: 1 specimen. Cat. No. 60914, U.S.N.M.

1 specimen. Cat. No. 46177, U.S.N.M.

11 specimens (1=type). Cat. No. 46152, U.S.N.M.

San Hipolito Point, Lower California: 4 specimens. Cat. No. 127546, U.S.N.M.

Point Abrejos, Lower California: 4 specimens. Cat. No. 105474, U.S.N.M.

4 specimens. Cat. No. 106499, U.S.N.M.

2 specimens. Kelsey collection.

ODOSTOMIA (CHRYSTALLIDA) DEFOLINIA Dall and Bartsch.

Margarita Island, Bay of Panama: 1 specimen, type. De Folin collection.

ODOSTOMIA (CHRYSTALLIDA) DEFOLINIA CONTRACTA De Folin.

Panama: 1 specimen. De Folin collection.

ODOSTOMIA (CHRYSTALLIDA) DEFOLINIA DIFFICILIS Dall and Bartsch.

Panama: 1 specimen. De Folin collection.

ODOSTOMIA (CHRYSTALLIDA) OREGONENSIS Dall and Bartsch.

Cumshewa Inlet, Queen Charlotte Islands, British Columbia: 10 specimens (1=type). Cat. No. 107690, U.S.N.M.

Monterey, Cal.: 1 specimen. Cat. No. 73998, U.S.N.M.

1 specimen. Cat. No. 196283, U.S.N.M.

ODOSTOMIA (CHRYSTALLIDA) BENTHINA Dall and Bartsch.

Mazatlan, Mexico: 2 specimens. Tablet 1971, Liverpool collection, British Museum.

ODOSTOMIA (CHRYSTALLIDA) PROMECES Dall and Bartsch.

Todos Santos Bay, Lower California: 1 specimen, type. Cat. No. 162777, U.S.N.M.

ODOSTOMIA (CHRYSTALLIDA) PULCHERRIMA Dall and Bartsch.

Terminal Island, San Pedro, Cal.: 1 specimen, type. Cat. No. 206900, U.S.N.M.
San Diego, Cal.: 1 specimen. Kelsey collection.

ODOSTOMIA (CHRYSTALLIDA) VINCTA Dall and Bartsch.

San Pedro, Cal.: 1 specimen, type. Cat. No. 162762, U.S.N.M.
1 specimen. Berry collection.

ODOSTOMIA (CHRYSTALLIDA) FASCIATA Carpenter.

Mazatlan, Mexico: 5 specimens. Tablet 1981, Liverpool collection, British Museum.

ODOSTOMIA (CHRYSTALLIDA) HELGA Dall and Bartsch.

Terminal Island, San Pedro, Cal.: 11 specimens. Cat. No. 206902, U.S.N.M.

San Pedro, Cal.: 100 specimens. Cat. No. 162774, U.S.N.M.

190 specimens. Oldroyd collection.

San Pedro Bay, Cal.: 9 specimens. Cat. No. 206901, U.S.N.M.

Pacific Beach, San Diego, Cal.: 6 specimens. Cat. No. 162773, U.S.N.M.

8 specimens. Kelsey collection.

San Diego, Cal.: 11 specimens (1=type). Cat. No. 60905, U.S.N.M.

4 specimens. Oldroyd collection.

? specimens. Gripp collection.

6 specimens. Kelsey collection.

Arch Beach, San Diego, Cal.: 1 specimen. Univ. of Cal. collection.

South end Coronado Island, Cal.: 2 specimens. 7-10 fathoms. Baker collection.

ODOSTOMIA (CHRYSTALLIDA) DICELLA Bartsch.

San Diego, Cal.: 1 specimen, type. Cat. No. 211562, U.S.N.M.

ODOSTOMIA (CHRYSTALLIDA) THALIA Bartsch.

North end of South Coronado Island, Cal.: 1 specimen, type. 6 fathoms. Cat. No. 249903, U.S.N.M.

ODOSTOMIA (CHRYSTALLIDA) SANCTORUM Dall and Bartsch.

Todos Santos Bay, Lower California: 4 specimens (1=type). Cat. No. 46439, U.S.N.M.

San Hipolito Point, Lower California: 3 specimens. Cat. No. 206803, U.S.N.M.

ODOSTOMIA (CHRYSTALLIDA) SAPIA Dall and Bartsch.

San Diego, Cal.: 1 specimen, type. Cat. No. 162775, U.S.N.M.

ODOSTOMIA (CHRYSTALLIDA) ROTUNDATA Carpenter.

Mazatlan, Mexico: 2 specimens. Tablet 1970, Liverpool collection, British Museum.

ODOSTOMIA (CHRYSTALLIDA) DECEPTRIX Dall and Bartsch.

San Hipolito Point, Lower California: 5 specimens (1=type). Cat. No. 206904, U.S.N.M.

Point Abreojos, Lower California: 3 specimens. Cat. No. 206905, U.S.N.M.

ODOSTOMIA (PYRGULINA) MARGINATA C. B. Adams.

Panama: 1 specimen, type. Amherst College collection.

ODOSTOMIA (EGILA) LACUNATA Carpenter.

Mazatlan, Mexico: 7 specimens (1=type). Tablet 1964, Liverpool collection, British Museum.

ODOSTOMIA (EGILA) POPPEI Dall and Bartsch.

Point Abreojos, Lower California: 2 specimens (1=type). Cat. No. 106519, U.S.N.M.

3 specimens. Arnold collection.

ODOSTOMIA (HALDRA) PHOTIS Carpenter.

Mazatlan, Mexico: 1 specimen, type. Tablet 1985, Liverpool collection, British Museum.

1 specimen. Tablet 1983, Liverpool collection, British Museum.

ODOSTOMIA (IVIDELLA) PEDROANA Dall and Bartsch.

San Pedro, Cal.: 1 specimen, type. Cat. No. 107422, U.S.N.M.

1 specimen. Cat. No. 162845, U.S.N.M.

4 specimens. Cat. No. 152171a, U.S.N.M.

9 specimens. Oldroyd collection.

San Pedro, White's Point, Cal.: 2 specimens. Oldroyd collection.

Laguna Beach, Cal.: 1 specimen. Ball collection.

Catalina Island, Cal.: 2 specimens. 12 fathoms. Cat. No. 46162, U.S.N.M.

Pacific Beach, Cal.: 1 specimen. Gripp collection.

San Diego, Cal.: U. S. B. F. station 3566, 3 fathoms, fine sand and black shell bottom. 5 specimens. Cat. No. 162846, U.S.N.M.

U.S.B.F. station 3572, 2 fathoms, mud and fine sand bottom.

7 specimens. Cat. No. 162847, U.S.N.M.

4 specimens. Cat. No. 109364, U.S.N.M.

2 specimens. Oldroyd collection.

(Off Coronado Hotel.) 1 specimen. Cat. No. 160094, U.S.N.M.

(Off Coronado Hotel.) 4 specimens. Cat. No. 74022, U.S.N.M.

(Off Coronado Hotel.) 1 specimen. Cat. No. 32305, U.S.N.M.

Scammon Lagoon, Lower California: 1 specimen. Cat. No. 106425, U.S.N.M.

ODOSTOMIA (IVIDELLA) NAVISA Dall and Bartsch.

San Pedro, Cal.: 30 specimens. Cat. No. 129336, U.S.N.M.

3 specimens. Cat. No. 162843, U.S.N.M.

San Pedro (White's Point), Cal.: 7 specimens. Oldroyd collection.

California: 28 specimens. Oldroyd collection.

Arch Beach, Cal.: 1 specimen. Univ. of Cal. collection.

Ocean Beach, San Diego, Cal.: 1 specimen. Cat. No. 62844, U.S.N.M.

San Diego, Cal.: 1 specimen. Kelsey collection.

Scammon Lagoon, Lower California: 4 specimens (1=type). Cat. No. 106502, U.S.N.M.

ODOSTOMIA (IVIDELLA) NAVISA DELMONTENSIS Dall and Bartsch.

Off Del Monte, Monterey Bay, Cal.: 1 specimen, type. 12 fathoms. Cat. No. 196297, U.S.N.M.

ODOSTOMIA (IVIDELLA) QUINQUECINCTA Carpenter.

Mazatlan, Mexico: 1 specimen. Tablet 1963, Liverpool collection, British Museum.

ODOSTOMIA (IVIDELLA) ORARIANA Dall and Bartsch.

Panama: 1 specimen, type. Amherst College collection.

ODOSTOMIA (MIRALDA) HEMPHILLI Dall and Bartsch.

San Pedro, Cal.: 1 specimen. Cat. No. 162842, U.S.N.M.

San Hipolito Point, Lower California: 1 specimen, type. Cat. No. 162841, U.S.N.M.

1 specimen. Hemphill collection.

Point Abreojos, Lower California: 1 specimen. Kelsey collection.

1 specimen. Cat. No. 106498, U.S.N.M.

ODOSTOMIA (MIRALDA) ARMATA Carpenter.

Mazatlan, Mexico: 1 specimen. Tablet 1965, Liverpool collection, British Museum.

ODOSTOMIA (MIRALDA) EKARATA Carpenter.

Mazatlan, Mexico: 1 specimen, type. Tablet 1966, Liverpool collection, British Museum.

ODOSTOMIA (MIRALDA) TERRELLUM C. B. Adams.

Panama Bay: 1 specimen. Amherst College collection.

ODOSTOMIA (MIRALDA) AEPYNOTA Dall and Bartsch.

San Pedro, Cal.: 31 specimens (1=type). Cat. No. 129335, U.S.N.M.
27 specimens. Oldroyd collection.

White's Point, San Pedro, Cal.: 2 specimens. Oldroyd collection.

Catalina Island, Cal.: 1 specimen. Berry collection.

San Diego, Cal.: 1 specimen. Gripp collection.

2 specimens. Kelsey collection.

3 specimens. Cat. No. 105467, U.S.N.M.

Cape St. Lucas, Lower California: 1 specimen. Cat. No. 16222, U.S.N.M.

ODOSTOMIA (MIRALDA) GALAPAGENSIS Dall and Bartsch.

Near the Galapagos Islands, South America: U.S.B.F. station 2813, 40 fathoms, coral and sand bottom. 1 specimen, type. Cat. No. 206906, U.S.N.M.

ODOSTOMIA (IVARA) TURRICULA Dall and Bartsch.

Monterey, Cal.: 1 specimen. Cat. No. 73999, U.S.N.M.

San Pedro, Cal.: 35 specimens (1=type). Cat. No. 168716, U.S.N.M.

10 specimens. Cat. No. 207128, U.S.N.M.

23 specimens. Oldroyd collection.

Arch Beach, 11 miles southeast of Newport Beach, Cal.: 2 specimens. Univ. of Cal. collection.

Catalina Island, Cal.: 3 specimens. Cat. No. 168717, U.S.N.M.

San Diego, Cal. 1 specimen. Kelsey collection.

Todos Santos Bay, Lower California: 1 specimen. Cat. No. 46176, U.S.N.M.

Point Abreojos, Lower California: 1 specimen. Cat. No. 105499, U.S.N.M.

ODOSTOMIA (EVALINA) AMERICANA Dall and Bartsch.

San Pedro, Cal.: 12 specimens (1=type). Cat. No. 168718, U.S.N.M.

10 specimens. Oldroyd collection.

Arch Beach, Cal.: 2 specimens. Univ. of Cal. collection.

Santa Catalina Island, Cal.: 2 specimens. Cat. No. 168720, U.S.N.M.

La Jolla, Cal.: 2 specimens. Cat. No. 162677, U.S.N.M.

San Diego, Cal.: 1 specimen. Cat. No. 168719, U.S.N.M.

South end Coronado Island, Cal.: 1 specimen. 7-10 fathoms. Baker collection.

ODOSTOMIA (EVALINA) INTERMEDIA Carpenter.

Mazatlan, Mexico: 1 specimen, type. Tablet 2010, Liverpool collection, British Museum.

ODOSTOMIA (IOLAEA) AMIANTA Dall and Bartsch.

Monterey Bay, Cal.: 1 specimen. Cat. No. 37253, U.S.N.M.

Monterey, off Del Monte, Cal.: 6 specimens, 12 fathoms. Berry collection.

1 specimen, 12 fathoms. Cat. No. 168683, U.S.N.M.

San Pedro, Cal.: 1 specimen. Cat. No. 168684, U.S.N.M.

2 specimens. Oldroyd collection.

Univ. of Cal. station 83. 1 specimen. Univ. of Cal. collection.

San Pedro, Long Beach, Cal.: 1 specimen. Cat. No. 196298, U.S.N.M.

Off Catalina Island, Cal.: Univ. of Cal. station 28. 1 specimen. Univ. of Cal. collection.

Univ. of Cal. station 30. 1 specimen. Univ. of Cal. collection.

Pacific Beach, Cal.: 1 specimen. Hemphill collection.

- San Diego, Cal.: 1 specimen. Gripp collection.
2 specimens. Kelsey collection.
Univ. of Cal. station 47. 11 specimens. Univ. of Cal. collection.
Univ. of Cal. station 47. 2 specimens. Cat. No. 160115, U.S.N.M.
- Univ. of Cal. station 47. 1 specimen. Cat. No. 105469, U.S.N.M.
- Off Coronado Island, Cal.: U.S.B.F. station 2932, 20 fathoms, gray sand and broken shell bottom; bottom temperature 58°. 1 specimen. Cat. No. 168685, U.S.N.M.
- Point Abreojos, Lower California: 2 specimens (1=type). Cat. No. 105483, U.S.N.M.
- ODOSTOMIA (IOLAEA) EUCOSMIA** Dall and Bartsch.
San Pedro, Cal.: 32 specimens. Cat. No. 129294, U.S.N.M.
1 specimen. Cat. No. 153091, U.S.N.M.
27 specimens. Oldroyd collection.
Arch Beach, Cal.: 2 specimens. Univ. of Cal. collection.
San Diego, Cal.: 2 specimens. Kelsey collection.
2 specimens. Cat. No. 105469 U.S.N.M.
San Diego, Sandspit, Cal.: 1 specimen. Cooke collection.
South end Coronado Island, Cal.: 7 specimens. 7-10 fathoms. Baker collection.
Todos Santos Bay, Lower California: 1 specimen. Cat. No. 46175, U.S.N.M.
Point Abreojos, Lower California: 1 specimen, type. Cat. No. 106501, U.S.N.M.
1 specimen. Cat. No. 105483, U.S.N.M.
- ODOSTOMIA (IOLAEA) DELICATULA** Carpenter.
Cape St. Lucas, Lower California: 1 specimen, type. Cat. No. 4102, U.S.N.M.
- ODOSTOMIA (MENESTHO) GRAMMATOSPIRA** Dall and Bartsch.
Cape St. Lucas, Lower California: 1 specimen, type. Cat. No. 161625, U.S.N.M.
- ODOSTOMIA (MENESTHO) PHARCIDA** Dall and Bartsch.
Cumshewa Inlet, Queen Charlotte Island, British Columbia: 1 specimen, type.
10-15 fathoms. Cat. No. 107440, U.S.N.M.
- ODOSTOMIA (MENESTHO) EXARA** Dall and Bartsch.
Pacific Grove, Monterey, Cal.: 1 specimen, type. Cat. No. 196250, U.S.N.M.
- ODOSTOMIA (MENESTHO) ZIZIPHINA** Carpenter.
Mazatlan, Mexico: 1 specimen. Tablet 1967, Liverpool collection, British Museum.
- ODOSTOMIA (MENESTHO) RECTA** De Folin.
Margarita Island, Panama Bay: 1 specimen, type. De Folin collection.
- ODOSTOMIA (MENESTHO) GLORIOSA** Bartsch.
San Diego, Cal.: 1 specimen, type. Cat. No. 211561, U.S.N.M.
San Hipolito Point, Lower California: 1 specimen, Kelsey collection.
- ODOSTOMIA (MENESTHO) AMILDA** Dall and Bartsch.
San Diego, Cal.: 1 specimen, type. Cat. No. 60905, U.S.N.M.
Round Island, Lower California: 2 specimens. Cat. No. 206907, U.S.N.M.
- ODOSTOMIA (MENESTHO) CALLIPYRGA** Dall and Bartsch.
Margarita Island, Bay of Panama: 1 specimen, type. De Folin collection.
- ODOSTOMIA (MENESTHO) EXCISA** Bartsch.
Catalina Island, Cal.: 1 specimen, type. Cat. No. 194518, U.S.N.M.
- ODOSTOMIA (MENESTHO) FARMA** Dall and Bartsch.
Catalina Island, Cal.: 1 specimen, type. Cat. No. 206908, U.S.N.M.
- ODOSTOMIA (MENESTHO) ENORA** Dall and Bartsch.
San Pedro, Cal.: 3 specimens (1=type). Cat. No. 207126, U.S.N.M.

ODOSTOMIA (MENESTHO) CHILENSIS Dall and Bartsch.

U. S. B. F. steamer *Albatross* at Tome, Chile: 1 specimen, type. Cat. No. 109363, U.S.N.M.

ODOSTOMIA (MENESTHO) FETELLA Dall and Bartsch.

Long Beach, Cal.: 10 specimens. Cat. No. 127053, U.S.N.M.

San Pedro, Cal.: 12 specimens. Cat. No. 126625, U.S.N.M.

1 specimen. Cat. No. 46498, U.S.N.M.

150 specimens. Cat. No. 208068, U.S.N.M.

4 specimens. Oldroyd collection.

San Diego, Cal.: 4 specimens. Univ. of Cal. collection.

4 specimens. Kelsey collection.

125 specimens (1=type). Cat. No. 46478, U.S.N.M.

8 specimens. Cat. No. 46477, U.S.N.M.

(Foot of Ash St.). 1 specimen. Oldroyd collection.

San Ignacio Lagoon, Lower California: 1 specimen. Cat. No. 106520, U.S.N.M.

ODOSTOMIA (MENESTHO) HYPOCURTA Dall and Bartsch.

Off Bristol Bay, Bering Sea, Alaska: U. S. B. F. station 3306, 33 fathoms, fine gray sand bottom, bottom temperature 38.9°. 1 specimen, type. Cat. No. 168660, U.S.N.M.

ODOSTOMIA (MENESTHO) AEQUISCULPTA Carpenter.

Cape St. Lucas, Lower California: 1 specimen, type. Cat. No. 16221, U.S.N.M.

ODOSTOMIA (MENESTHO) HARFORDENSIS Dall and Bartsch.

Port Harford, Cal.: 1 specimen, type. Cat. No. 196299, U.S.N.M.

ODOSTOMIA (MENESTHO) SUBLIRULATA Carpenter.

Mazatlan, Mexico: 1 specimen, type. Tablet 1952, Liverpool collection, British Museum.

ODOSTOMIA (EVALEA) NUNIVAKENSIS Dall and Bartsch.

North end of Nunivak Island, Alaska: 1 specimen. Cat. No. 159476, U.S.N.M.

ODOSTOMIA (EVALEA) KILLISNOOENSIS Dall and Bartsch.

Killisnoo, Alaska: 1 specimen, type. Cat. No. 159457, U.S.N.M.

3 specimens. Cat. No. 205214, U.S.N.M.

ODOSTOMIA (EVALEA) YOUNGI Dall and Bartsch.

Ship channel, Barkley Sound, British Columbia: 1 specimen. 18-20 fathoms. Cat. No. 211542, U.S.N.M.

1 specimen. 18-20 fathoms.

Can. Geol. Sur. Museum collection, Ottawa.

ODOSTOMIA (EVALEA) THEA Bartsch.

San Pedro, Cal.: 1 specimen, type. Cat. No. 211556, U.S.N.M.

ODOSTOMIA (EVALEA) CALLIOPE Bartsch

Off Point La Jolla, Cal.: U. S. B. F. station 4322, 110 to 199 fathoms, green mud and shell bottom. 1 specimen, type. Cat. No. 211557, U.S.N.M.

ODOSTOMIA (EVALEA) CALCARELLA Bartsch.

Off Santa Rosa Island, Cal.: U. S. B. F. station 2901, 48 fathoms, gray sand and mud bottom; bottom temperature 55.1°. 1 specimen, type. Cat. No. 211587, U.S.N.M.

ODOSTOMIA (EVALEA) TILLAMOOKENSIS Dall and Bartsch.

Off Tillamook, Oregon: U. S. B. F. station 3346, 786 fathoms, green mud bottom; bottom temperature 37.3°. 1 specimen. Cat. No. 196244, U.S.N.M.

ODOSTOMIA (EVALEA) ESILDA Dall and Bartsch.

Off San Diego, Cal.: U. S. B. F. station 2936, 359 fathoms, mud bottom; bottom temperature 49°. 1 specimen, type. Cat. No. 206909, U.S.N.M.

ODOSTOMIA (EVALEA) SPREADBOROUGHII Dall and Bartsch.

- Ship channel, Barkley Sound, British Columbia: 2 specimens 18-20 fathoms.
Can. Geol. Sur. Museum,
Ottawa.
1 specimen, type. 18-20 fathoms. Cat. No. 211541, U.S.N.M.

ODOSTOMIA (EVALEA) VANCOUVERENSIS Dall and Bartsch.

- Ship channel, Barkley Sound, British Columbia: 3 specimens (1=type). 18-20 fathoms. Cat. No. 211539, U.S.N.M.
4 specimens. 18-20 fathoms.
Can. Geol. Sur. Museum,
Ottawa.

ODOSTOMIA (EVALEA) ALEUTICA Dall and Bartsch.

- Off Iliuliuk Harbor, Bering Sea, Alaska: U.S.B.F. station 3336, 55 fathoms, black sand bottom, bottom temperature 41.6°. 14 specimens. (Description based upon two of this lot.) Cat. No. 205179, U.S.N.M.

Captains' Harbor, Unalaska, Alaska: 1 specimen. 25 fathoms. Cat. No. 159464, U.S.N.M.

Amaknak Island, Unalaska, Alaska: 1 specimen. Cat. No. 160958, U.S.N.M.

ODOSTOMIA (EVALEA) KADIAKENSIS Dall and Bartsch.

- Kadiak Island, Alaska: 2 specimens (1=type). Cat. No. 159470, U.S.N.M.

ODOSTOMIA (EVALEA) QUADRE Dall and Bartsch.

- Ship channel, Barkley Sound, British Columbia: 26 specimens (1=type). 18-20 fathoms. Cat. No. 211540, U.S.N.M.
27 specimens. 18-20 fathoms.
Can. Geol. Sur. Museum,
Ottawa.

ODOSTOMIA (EVALEA) CALLIMENE Bartsch.

- San Pedro, Cal.: 1 specimen, type. Cat. No. 211555, U.S.N.M.

ODOSTOMIA (EVALEA) HERILDA Dall and Bartsch.

- Off San Diego, Cal.: 1 specimen, type. Cat. No. 206910, U.S.N.M.

ODOSTOMIA (EVALEA) CYPRIA Dall and Bartsch.

- Skidegate, British Columbia: 1 specimen, type. Can. Geol. Sur. collection.

ODOSTOMIA (EVALEA) HYPATIA Dall and Bartsch.

- Skidegate, British Columbia: 1 specimen, type. Can. Geol. Sur. collection.

ODOSTOMIA (EVALEA) TENUIS Carpenter.

- Mazatlan, Mexico: 1 specimen. Tablet 1958, Liverpool collection, British Museum.

ODOSTOMIA (EVALEA) VALDEZI Dall and Bartsch.

- Barkley Sound, British Columbia: 5 specimens. Can. Geol. Sur. collection.
5 specimens. Cat. No. 211575, U.S.N.M. collection.
Orcas Island, Puget Sound, Wash.: 1 specimen. Baker collection.
Off Del Monte, Monterey, Cal.: 2 specimens (1=type). 12 fathoms. Cat. No. 196249, U.S.N.M.
2 specimens. Berry collection.

ODOSTOMIA (EVALEA) NEMO Dall and Bartsch.

- San Pedro, Cal.: 5 specimens. Cat. No. 126626, U.S.N.M.
15 specimens. Cat. No. 206912, U.S.N.M.
29 specimens. Oldroyd collection.

San Diego, Cal.: Univ. of Cal. station 1. 2 specimens. Univ. of Cal. collection.
1 specimen, type. Cat. No. 206911, U.S.N.M.

ODOSTOMIA (EVALEA) IO Dall and Bartsch.

Santa Barbara Channel, Cal.: 2 specimens. 6 fathoms. Cat. No. 107741, U.S.N.M.

Santa Rosa Island, Cal.: 2 specimens (1=type). Cat. No. 56770, U.S.N.M.

San Pedro, Cal.: 1 specimen. Cat. No. 15316, U.S.N.M.

Off Santa Catalina Island, Cal.: Univ. of Cal. station 30. 1 specimen. Univ. of Cal. collection.

San Diego, Cal.: 1 specimen. Gripp collection.

2 specimens. Kelsey collection.

Point Loma, San Diego, Cal.: 1 specimen. Kelsey collection.

ODOSTOMIA (EVALEA) BARKLEYENSIS Dall and Bartsch.

Barkley Sound, British Columbia: 2 specimens (1=type). 18-20 fathoms.
Cat. No. 211543, U.S.N.M.

3 specimens. 18-20 fathoms. Can. Geol.
Sur. collection.

ODOSTOMIA (EVALEA) PRATOMA Dall and Bartsch.

Off Santa Rosa Island, Cal.: U.S.B.F. station 2902, 53 fathoms, fine gray sand
and mud bottom; bottom temperature 45°. .
22 specimens (1=type). Cat. No. 206913,
U.S.N.M.

U.S.B.F. station 2901, 48 fathoms, gray sand and
mud bottom; bottom temperature 55.1°. 15
specimens. Cat. No. 206914, U.S.N.M.

ODOSTOMIA (EVALEA) COOKEANA Bartsch.

Ellamar, Alaska: 2 specimens. Cat. No. 208427, U.S.N.M.

ODOSTOMIA (EVALEA) SEPTENTRIONALIS Dall and Bartsch.

Unalaska, Alaska: 3 specimens (1=type). Cat. No. 159462, U.S.N.M.

ODOSTOMIA (EVALEA) CAPITANA Dall and Bartsch.

St. Paul, Kodiak Island, Alaska: 1 specimen. 12 fathoms. Cat. No. 159468,
U.S.N.M.

Captains' Harbor, Unalaska, Alaska: 1 specimen, type. Cat. No. 159464b,
U.S.N.M.

ODOSTOMIA (EVALEA) JEWETTI Dall and Bartsch.

Santa Barbara, Cal.: 2 specimens, cotypes. Cat. No. 15521c, U.S.N.M.

ODOSTOMIA (EVALEA) INFLATA Carpenter.

Orcas Island, Puget Sound, Wash.: 1 specimen. Baker collection.

Neah Bay, Wash.: 2 specimens (1=type). Cat. No. 15521b, U.S.N.M.

ODOSTOMIA (EVALEA) COLUMBIANA Dall and Bartsch.

Off Fort Rupert, Vancouver Island, British Columbia: U.S.B.F. station 4203,
2-30 fathoms, volcanic, shell, gravel, broken shell, and sponge bottom; bottom
temperature 49.1°. 1 specimen. Cat. No. 196246, U.S.N.M.

Victoria, Vancouver Island, British Columbia: 6 specimens (1=type). Cat. No.
126658, U.S.N.M.

Off Port Townsend, Wash.: U.S.B.F. station 4213, 23-25 fathoms, gray sand,
broken shell and rocky bottom; bottom temperature 51°. 3 specimens. Cat.
No. 196245, U.S.N.M.

ODOSTOMIA (EVALEA) UNALASKENSIS Dall and Bartsch.

Captains' Harbor, Unalaska, Alaska: 1 specimen, type. Cat. No. 150464a.

ODOSTOMIA (EVALEA) ATOSSA Dall.

San Pedro, Cal.: 2 specimens (1=type). Cat. No. 110637, U.S.N.M.

ODOSTOMIA (EVALEA) OBESA Dall and Bartsch.

San Pedro, Cal.: 9 specimens (1=type). Cat. No. 206915, U.S.N.M.

ODOSTOMIA (EVALEA) LUCASANA Dall and Bartsch.

Cape St. Lucas, Lower California: 1 specimen, type. Cat. No. 16220, U.S.N.M.

ODOSTOMIA (EVALEA) PHANEA Dall and Bartsch.

Monterey, Cal.: 1 specimen, type. Cat. No. 46488, U.S.N.M.

1 specimen. Cat. No. 46474, U.S.N.M.

1 specimen. Cat. No. 46479, U.S.N.M.

2 specimens. Cat. No. 159459, U.S.N.M.

1 specimen. Cat. No. 46496, U.S.N.M.

1 specimen. Univ. of Cal. collection.

3 specimens. Button collection.

ODOSTOMIA (EVALEA) PHANELLA Dall and Bartsch.

San Pedro Bay, Cal.: 1 specimen, type. Cat. No. 196348, U.S.N.M.

La Jolla, Cal.: 1 specimen. Cat. No. 162676, U.S.N.M.

Ballast Point, San Diego, Cal.: 1 specimen. Cat. No. 152324, U.S.N.M.

ODOSTOMIA (EVALEA) SANTAROSANA Dall and Bartsch.

Santa Rosa Island, Cal.: 1 specimen, type. Cat. No. 56770, U.S.N.M.

ODOSTOMIA (EVALEA) TENUISCULPTA Carpenter.

Barkley Sound, British Columbia: 1 specimen. Can. Geol. Sur. collection.

1 specimen. Cat. No. 211577, U.S.N.M.

Neah Bay, Wash.: 1 specimen, type. Cat. No. 15520, U.S.N.M.

2 specimens (1 figured). Cat. No. 46483, U.S.N.M.

Little River, Mendocino County, Cal.: 75 specimens. Cat. No. 46486, U.S.N.M.

Gualala, Mendocino County, Cal.: 6 specimens. Cat. No. 101945, U.S.N.M.

Oakland, Cal.: 21 specimens. Cat. No. 46484, U.S.N.M.

San Francisco, Cal.: 2 specimens. Cat. No. 74006, U.S.N.M.

2 specimens. Univ. of Cal. collection.

Santa Cruz, Cal.: 3 specimens. Oldroyd collection.

Monterey, Cal.: 30 specimens. Cat. No. 46482, U.S.N.M.

30 specimens. Cat. No. 46483, U.S.N.M.

30 specimens. Cat. No. 46485, U.S.N.M.

31 specimens. Cat. No. 46489, U.S.N.M.

2 specimens. Cat. No. 46491, U.S.N.M.

4 specimens. Cat. No. 46476, U.S.N.M.

1 specimen. Cat. No. 159475, U.S.N.M.

17 specimens. Cat. No. 159477, U.S.N.M.

5 specimens. Cat. No. 159478, U.S.N.M.

13 specimens. Cat. No. 159479, U.S.N.M.

1 specimen. Cat. No. 159480, U.S.N.M.

4 specimens. Univ. of Cal. collection.

Port Harford, Cal.: 1 specimen. Cat. No. 196247, U.S.N.M.

Santa Barbara, Cal.: 15 specimens. Berry collection.

San Miguel Island, Cal.: 1 specimen. Cat. No. 56680, U.S.N.M.

Long Beach, Cal.: 1 specimen. Lowe collection.

Off San Pedro, Cal.: Univ. of Cal. station 83. 2 specimens. Univ. of Cal. collection.

San Pedro Bay, Cal.: 2 specimens. Berry collection.

San Pedro, Cal.: 5 specimens, 1 young. Baldrige collection.

Newport, Cal.: Univ. of Cal. station 20. 9 specimens. Univ. of Cal. collection.

Arch Beach, Cal.: Univ. of Cal. station 50. 1 specimen. Univ. of Cal. collection.

San Diego, Cal.: (Foot of Ash St.) 1 specimen. Oldroyd collection.

4 specimens. Cat. No. 60907, U.S.N.M.

Off San Diego, Cal.: 1 specimen. 20 fathoms. Kelsey collection.
California: 42 specimens. Univ. of Cal. collection.
Round Island, Lower California: 2 specimens. Hemphill collection.
Lower California: (Type of *straminea* Carpenter.) 1 specimen. Cat. No. 15561, U.S.N.M.

ODOSTOMIA (EVALEA) ANGULARIS Dall and Bartsch.

Sitka Harbor, Alaska: 5 specimens. Cat. No. 159474, U.S.N.M.
Nanaimo, British Columbia: 5 specimens (1=type). Cat. No. 150585, U.S.N.M.
Barkley Sound, British Columbia: 20 specimens. U.S.N.M.
21 specimens. Can. Geol. Sur. collection.
Victoria, Vancouver Sound, British Columbia: 3 specimens. Cat. No. 126664, U.S.N.M.
Puget Sound, Wash.: 1 specimen. Cat. No. 43384, U.S.N.M.
Del Monte, Monterey Bay, Cal.: 18 specimens. 12 fathoms. Berry collection.
Port Harford, Cal.: 4 specimens. Cat. No. 161624, U.S.N.M.
Off middle California: U.S.B.F. station 3194, 92 fathoms, gray sand bottom; bottom temperature 45.9°. 1 specimen. Cat. No. 196300, U.S.N.M.

ODOSTOMIA (EVALEA) SOCORROENSIS Dall and Bartsch.

Socorro Island, Mexico: 85 specimens (1=type). Cat. No. 153024, U.S.N.M.

ODOSTOMIA (EVALEA) BALDRIDGEAE Bartsch.

San Pedro, Cal.: 1 specimen, type. Cat. No. 211558, U.S.N.M.
1 specimen (young). Baldrige collection.

ODOSTOMIA (EVALEA) DONILLA Dall and Bartsch.

San Pedro, Cal.: 3 specimens. Oldroyd collection.
9 specimens (1=type). Cat. No. 126626, U.S.N.M.
6 specimens (young). Baldrige collection.
Ballast Point, San Diego, Cal.: 2 specimens. Cat. No. 152324, U.S.N.M.
San Diego, Cal.: 8 specimens. Oldroyd collection.
3 specimens. Kelsey collection.
Todos Santos Bay, Lower California: 1 specimen. Cat. No. 46497, U.S.N.M.
2 specimens. Cat. No. 46470, U.S.N.M.

ODOSTOMIA (EVALEA) CALIFORNICA Dall and Bartsch.

Ocean Beach, San Diego, Cal.: 1 specimen, type. Cat. No. 206916, U.S.N.M.
San Diego, Cal.: 1 specimen. Cat. No. 153056, U.S.N.M.
1 specimen. Kelsey collection.
Off South Coronado Island, Cal.: 3 specimens. 3 fathoms. Baker collection.

ODOSTOMIA (EVALEA) SERILLA Dall and Bartsch.

San Pedro, Cal.: 1 specimen. Oldroyd collection.
San Diego, Cal.: 1 specimen. 15 fathoms. Gripp collection.
Off San Diego, Cal.: Univ. of Cal. station 59. 1 specimen, type. Cat. No. 206917, U.S.N.M.

ODOSTOMIA (EVALEA) TACOMAENSIS Dall and Bartsch.

Tacoma, Wash.: 1 specimen, type. Cat. No. 159267, U.S.N.M.

ODOSTOMIA (EVALEA) AMCHITKANA Dall and Bartsch.

Constantine Harbor, Amchitka Island, Alaska: 2 specimens (1=type). Cat. No. 161088, U.S.N.M.
Ellamar, Alaska: 1 specimen. Cat. No. 208426, U.S.N.M.
3 specimens. Baker collection.
Bear Bay, Peril Straits, Alaska: 4 specimens. Stephens collection.
2 specimens. Cat. No. 204013, U.S.N.M.

ODOSTOMIA (EVALEA) STEPHENSI Dall and Bartsch.

Bear Bay, Peril Straits, Alaska: 3 specimens (1=type). Cat. No. 204010 U.S.N.M.
6 specimens. Stephens collection.

Barkley Sound, British Columbia: 30 specimens. Can. Geol. Survey collection.
28 specimens. Cat. No. 211576, U.S.N.M.

Skidegate, British Columbia: 1 specimen. Cat. No. 220119, U.S.N.M.
2 specimens. Can. Geol. Sur. collection.

ODOSTOMIA (EVALEA) CLESSINI Dall and Bartsch.

Hawk Inlet, Admiralty Island, Alaska: 2 specimens. Cat. No. 204015, U.S.N.M.
3 specimens. Stephens collection.

Bear Bay, Peril Straits, Alaska: 7 specimens. Stephens collection.
2 specimens (1=type). Cat. No. 204014, U.S.N.M.

Mole Harbor, Admiralty Island, Alaska: 1 specimen. Stephens collection.

Sitka, Alaska: 2 specimens. Cat. No. 159461, U.S.N.M.

ODOSTOMIA (EVALEA) MINUTISSIMA Dall and Bartsch.

San Diego, Cal.: 6 specimens (1=type). Cat. No. 206918, U.S.N.M.

San Hipolito Point, Lower California: 2 specimens. Cat. No. 206919, U.S.N.M.

Point Abreojos, Lower California: 3 specimens. Cat. No. 105484, U.S.N.M.

ODOSTOMIA (EVALEA) RAYMONDI Dall and Bartsch.

Off Catalina Island, Cal.: Univ. of Cal. station 30. 1 specimen, type. Cat. No.
206920, U.S.N.M.

Univ. of Cal. station 30. 1 specimen, topotype. Univ.
of Cal. collection.

ODOSTOMIA (EVALEA) GRAVIDA Gould.

Santa Barbara, Cal.: 1 specimen, type. Cat. No. 44, Orig. No. 24, A. 31, 10,
State Museum, Albany, N. Y.

ODOSTOMIA (EVALEA) NOTILLA Dall and Bartsch.

Off Catalina Island, Cal.: Univ. of Cal. station 30. 1 specimen, type. Cat. No.
206921, U.S.N.M.

Univ. of Cal. station 30. 1 specimen, topotype. Univ.
of Cal. collection.

ODOSTOMIA (EVALEA) MOVILLA Dall and Bartsch.

Off San Diego, Cal.: U.S.B.F. station 2936, 359 fathoms, mud bottom; bottom tem-
perature 49°. 8 specimens (1=type). Cat. No. 206922, U.S.N.M.

ODOSTOMIA (EVALEA) ALTINA Dall and Bartsch.

Off San Diego, Cal.: U.S.B.F. station 2936, 359 fathoms, mud bottom; bottom
temperature 49°. 3 specimens (1=type). Cat. No. 206923, U.S.N.M.

ODOSTOMIA (EVALEA) PROFUNDICOLA Dall and Bartsch.

Off Point Vincente, Cal.: Univ. of Cal. station 13. 1 specimen. Univ. of Cal.
collection.

Off San Diego, Cal.: U.S.B.F. station 2936, 359 fathoms, mud bottom; bottom tem-
perature 49°. 9 specimens (1=type). Cat. No. 206924, U.S.N.M.

ODOSTOMIA (EVALEA) BARANOFFENSIS Dall and Bartsch.

Mole Harbor, Admiralty Island, Alaska: 1 specimen. Cat. No. 204012, U.S.N.M.
1 specimen. Stephens collection.

Bear Bay, Peril Straits, Baranof Island, Alaska: 2 specimens. Stephens collec-
tion.

1 specimen, type. Cat. No.
204011, U.S.N.M.

ODOSTOMIA (EVALEA) SITKAENSIS Clessin.

Sitka, Alaska: 2 specimens. Cat. No. 26232, Berlin Museum collection.

ODOSTOMIA (EVALEA) HAGEMEISTERI Dall and Bartsch.

Hagemeister Island, Bering Sea: 1 specimen, type. Cat. No. 159469, U.S.N.M.

ODOSTOMIA (EVALEA) SKIDEGATENSIS Bartsch.

- Skidegate, British Columbia: Can. Geol. Sur. station 5. 2 specimens, cotypes.
 Can. Geol. Sur. collection.
 Can. Geol. Sur. station 5. 1 specimen. Cat. No. 220116, U.S.N.M.
 Can. Geol. Sur. station 4. 1 specimen. Cat. No. 220117, U.S.N.M.
 Can. Geol. Sur. station 4. 1 specimen. Can. Geol. Sur. collection.
 Can. Geol. Sur. station 2. 1 specimen. Can. Geol. Sur. collection.
 Can. Geol. Sur. station 2. 1 specimen. Cat. No. 220118, U.S.N.M.

ODOSTOMIA (EVALEA) RESINA Dall and Bartsch.

- Arch Beach, Cal.: 1 specimen. Cat. No. 206925, U.S.N.M.

ODOSTOMIA (EVALEA) DELICIOSA Dall and Bartsch.

- Barkley Sound, British Columbia: 1 specimen. Can. Geol. Sur. collection.
 Ballard Beach, Seattle, Wash.: 1 specimen. Baker collection.
 Monterey, Cal.: 1 specimen, type. Cat. No. 46492, U.S.N.M.
 1 specimen. Cat. No. 196301, U.S.N.M.

ODOSTOMIA (EVALEA) PARELLA Dall and Bartsch.

- Near the Galapagos Islands, South America: U.S.B.F. station 2808, 634 fathoms, coral and sand bottom; bottom temperature 39.9°. 1 specimen, type. Cat. No. 206928, U.S.N.M.

ODOSTOMIA (EVALEA) GRANADENSIS Dall and Bartsch.

- Off Panama Bay: U.S.B.F. station 2794, 62 fathoms, gray sand, black specks and broken-shell bottom; bottom temperature 59.6°. 1 specimen, type. Cat. No. 206927, U.S.N.M.

ODOSTOMIA (EVALEA) PALMERI Bartsch.

- Gulf of California: 2 specimens (1=type). Cat. No. 198903, U.S.N.M.

ODOSTOMIA (EVALEA) CASSANDRA Bartsch.

- Skidegate, British Columbia: 1 specimen, cotype. Can. Geol. Sur. collection.
 1 specimen, cotype. Cat. No. 220120, U.S.N.M.

ODOSTOMIA (AMAURA) LASTRA Dall and Bartsch.

- Santa Catalina Channel, Cal.: 1 specimen. Cat. No. 170794, U.S.N.M.
 Off Catalina Island, Cal.: Univ. of Cal. station 21 (3). 1 specimen. Univ. of Cal. collection.
 Univ. of Cal. station 30. 1 specimen. Univ. of Cal. collection.
 Off San Diego, Cal.: Univ. of Cal. station 81. 1 specimen. Univ. of Cal. collection.
 Off Southern California: U.S.B.F. station 2917, 90 fathoms, fine gray sand and broken shell bottom; bottom temperature 49.1°. 1 specimen, type. Cat. No. 206928, U.S.N.M.

ODOSTOMIA (AMAURA) KENNERLEYI Dall and Bartsch.

- Nanaimo, British Columbia: 1 specimen, type. Cat. No. 150564, U.S.N.M.
 Barkley Sound, British Columbia: 13 specimens. Cat. No. 211582, U.S.N.M.
 15 specimens. Can. Geol. Sur. collection.
 Puget Sound, Wash.: 2 specimens. Cat. No. 44936, U.S.N.M.
 1 specimen. Cat. No. 184258, U.S.N.M.
 Seattle, Wash.: 1 specimen. Cat. No. 129121, U.S.N.M.
 Off Pt. Pinos Light, California: U.S.B.F. station 4474, 34-43 fathoms, hard sand and mud bottom. 1 specimen. Cat. No. 208507, U.S.N.M.

ODOSTOMIA (AMAURA) ELSA Dall and Bartsch.

Kadiak Island, Alaska: 1 specimen, type. Cat. No. 55811, U.S.N.M.

ODOSTOMIA (AMAURA) BERINGI Dall.

St. Michael, Norton Sound, Alaska: 1 specimen, type. Cat. No. 169456, U.S.N.M.

ODOSTOMIA (AMAURA) SUBGLOBOSA Bartsch.

San Diego, Cal.: 1 specimen, type. Cat. No. 211560, U.S.N.M.

1 specimen. Kelsey collection.

ODOSTOMIA (AMAURA) SATURA Carpenter.

Neah Bay, Wash.: 1 specimen, type. Cat. No. 15520, U.S.N.M.

1 specimen. Cat. No. 15520a, U.S.N.M.

ODOSTOMIA (AMAURA) HELENA Bartsch.

San Pedro, Cal.: 1 specimen, type. Cat. No. 249904, U.S.N.M.

ODOSTOMIA (AMAURA) GRIPPIANA Bartsch.

Nanaimo, British Columbia: 1 specimen, type. Cat. No. 211559, U.S.N.M.

ODOSTOMIA (AMAURA) FARALLONENSIS Dall and Bartsch.

Off the Farallones Islands, Cal.: U.S.B.F. station 3180, 24 fathoms, fine gray sand bottom; bottom temperature 50.7°. 1 specimen, type. Cat. No. 168827, U.S.N.M.

ODOSTOMIA (AMAURA) SILLANA Dall and Bartsch.

West of Amaknak Island, Unalaska: 1 specimen, type. 60 fathoms. Cat. No. 168809, U.S.N.M.

ODOSTOMIA (AMAURA) TALPA Dall and Bartsch.

Mole Harbor, Alaska: 1 specimen, type. Cat. No. 204027, U.S.N.M.

2 specimens. Stephens collection.

Sitka Harbor, Alaska: 2 specimens. 12 fathoms. Cat. No. 159472, U.S.N.M.

ODOSTOMIA (AMAURA) KRAUSEI Clessin.

Killisnoo, Alaska: 1 specimen, type. Cat. No. 36335, Berlin Museum.

1 specimen. Cat. No. 159454, U.S.N.M.

Kadiak, Alaska: 1 specimen. Cat. No. 159471, U.S.N.M.

ODOSTOMIA (AMAURA) ELDORANA Bartsch.

Kadiak Island, Alaska; 2 specimens (1=type). Cat. No. 34246, U.S.N.M.

ODOSTOMIA (AMAURA) ORCIA Dall and Bartsch.

Santa Rosa Island, Cal.: 1 specimen, type. Cat. No. 206929, U.S.N.M.

San Diego, Cal.: 1 specimen. Kelsey collection.

ODOSTOMIA (AMAURA) GOULDI Carpenter.

Neah Bay, Wash.: 1 specimen. Cat. No. 22821, U.S.N.M.

ODOSTOMIA (AMAURA) ARCTICA Dall and Bartsch.

Sea-Horse Islands, Arctic Ocean: 1 specimen. Cat. No. 109454, U.S.N.M.

Off Icy Cape, Arctic Ocean: 4 specimens. 15 fathoms. Cat. No. 168807, U.S.N.M.

1 specimen. 7-15 fathoms. Cat. No. 168808, U.S.N.M.

2 specimens. Cat. No. 87863, U.S.N.M.

Southwest of Hagemeister Island, Bering Sea, Alaska: U.S.B.F. station 3305, 23 fathoms, fine gray sand bottom; bottom temperature 41.8°. 2 specimens (1=type). Cat. No. 168766, U.S.N.M.

Off Bristol Bay, Bering Sea: U.S.B.F. station 3306, 33 fathoms, fine gray sand bottom; bottom temperature 38.9°. 8 specimens. Cat. No. 87863, U.S.N.M.

ODOSTOMIA (AMAURA) AVELLANA Carpenter.

Neah Bay, Wash.: 1 specimen, type. Cat. No. 15517b, U.S.N.M.

ODOSTOMIA (AMAURA) MORATORA Dall and Bartsch.

Point Reyes, Cal.: U.S.B.F. station 3164, 61 fathoms, rocky bottom; bottom temperature 48.5°. 1 specimen, type. Cat. No. 207261, U.S.N.M.

ODOSTOMIA (AMAURA) PESA Dall and Bartsch.

Kadiak Island, Alaska: 1 specimen, type. Cat. No. 157458, U.S.N.M.

ODOSTOMIA (AMAURA) NOTA Dall and Bartsch.

Off Santa Rosa Island, Cal.: U.S.B.F. station 2901, 48 fathoms, gray sand and mud bottom; bottom temperature 55.1°. 9 specimens. Cat. No. 206930, U.S.N.M.

San Pedro, Cal.: 4 specimens. Cat. No. 168804, U.S.N.M.

7 specimens. Oldroyd collection.

1 specimen. Berry collection.

Off Newport, Cal.: Univ. of Cal. station 20. 8 specimens. Univ. of Cal. collection.

Off Catalina Island, Cal.: Univ. of Cal. station 32. 5 specimens. Univ. of Cal. collection.

Univ. of Cal. station 34. 5 specimens. Univ. of Cal. collection.

Univ. of Cal. station 36. 3 specimens. Univ. of Cal. collection.

Pacific Beach, Cal.: 2 specimens. Kelsey collection.

Ocean Beach, Cal.: 2 specimens. Kelsey collection.

San Diego, Cal.: 3 specimens. Kelsey collection.

4 specimens. Gripp collection.

17 specimens (1=type). Cat. No. 46490, U.S.N.M.

Univ. of Cal. station 47. 3 specimens. Univ. of Cal. collection.

ODOSTOMIA (AMAURA) ILIULIKENSIS Dall and Bartsch.

Iliuliuk Village, Captains' Bay, Unalaska, Alaska: 1 specimen, type. 6 fathoms. Cat. No. 159463, U.S.N.M.

Eider Cove, Captains' Bay, Unalaska, Alaska: 10 specimens. 25 fathoms. Cat. No. 159453, U.S.N.M.

Unalaska, Alaska: 1 specimen. Cat. No. 159465, U.S.N.M.

ODOSTOMIA (AMAURA) NUCIFORMIS Carpenter.

Neah Bay, Wash.: 1 specimen, type. Cat. No. 15517a, U.S.N.M.

ODOSTOMIA (AMAURA) CANFIELDI Dall.

Barkley Sound, British Columbia: 3 specimens. Can. Geol. Sur. collection.

2 specimens. Cat. No. 211583, U.S.N.M.

Monterey, Cal.: 1 specimen, type. Cat. No. 46473, U.S.N.M.

4 specimens. Cat. No. 46475, U.S.N.M.

2 specimens. Cat. No. 159451, U.S.N.M.

5 specimens. Cat. No. 159454, U.S.N.M.

1 specimen. Cat. No. 168803, U.S.N.M.

2 specimens. Univ. of Cal. collection.

Del Monte, Monterey Bay, Cal.: ? specimens. 12 fathoms. Berry collection.

San Pedro, Cal.: 2 specimens. Cat. No. 168799, U.S.N.M.

7 specimens. Oldroyd collection.

Pacific Beach, San Diego, Cal.: 2 specimens. Cat. No. 168806, U.S.N.M.

San Diego, Cal.: 1 specimen. Cat. No. 168800, U.S.N.M.

2 specimens. Kelsey collection.

ODOSTOMIA (AMAURA) SUBTURREITA Dall and Bartsch.

Off Santa Rosa Island, Cal.: U. S. B. F. station 2901, 48 fathoms, gray sand and mud bottom; bottom temperature 55.1°. 1 specimen. Cat. No. 206931, U.S.N.M.

Redondo, Cal.: Univ. of Cal. station 12. 1 specimen. Univ. of Cal. collection.

- San Pedro, Cal.: 5 specimens. Cat. No. 206932, U.S.N.M.
10 specimens (1=type). Cat. No. 168801, U.S.N.M.
8 specimens. Oldroyd collection.
6 specimens (4 young). Baldrige collection.
Santa Barbara, Cal.: 2 specimens. Univ. of Cal. collection.
Pacific Beach, San Diego, Cal.: 2 specimens. Cat. No. 206933, U.S.N.M.
Point Loma, San Diego, Cal.: 3 specimens. Kelsey collection.
San Diego, Cal.: 3 specimens. Cat. No. 105535, U.S.N.M.
7 specimens. Gripp collection.
Todos Santos Bay, Lower California: 1 specimen. Cat. No. 46472, U.S.N.M.
Lower California: 2 specimens. Baldrige collection.

ODOSTOMIA (AMAURA) MARTENSI Dall and Bartsch.

- Killisnoo, Alaska: 1 specimen, type. Cat. No. 38335, Berlin Museum.

ODOSTOMIA (SCALENOSTOMA) DOTELLA Dall and Bartsch.

- Off Cerralvo Island, Gulf of California: U. S. B. F. stations 2826-2828, 9½ to 10 fathoms, shell bottom. 7 specimens (1=type). Cat. No. 206934, U.S.N.M.
Off La Paz, Gulf of California: U. S. B. F. station 2823, 26½ fathoms, broken shell bottom. 6 specimens. Cat. No. 206935, U.S.N.M.
U. S. B. F. station 2822, 21 fathoms, gray sand and broken shell bottom 1 specimen Cat. No. 206936, U.S.N.M.

ODOSTOMIA (SCALENOSTOMA) BABYLONIA Bartsch.

- San Hipolito Point, Lower California: 2 specimens (1=type). Cat. No. 127542 U.S.N.M.

ODOSTOMIA (SCALENOSTOMA) RANGII De Folin.

- Bay of Panama?: 1 specimen, type. De Folin collection.

ODOSTOMIA (HEIDA) KELSEYI Bartsch.

- San Diego, Cal.: 1 specimen, type. Cat. No. 211544, U.S.N.M.
1 specimen. Kelsey collection.

ODOSTOMIA (HEIDA) PANAMENSIS Clessin.

- Panama: 2 specimens. Berlin collection.

ODOSTOMIA (ODOSTOMIA) FARELLA Dall and Bartsch.

- Off Long Beach, Cal.: 1 specimen, type. Cat. No. 206937, U.S.N.M.

ODOSTOMIA (ODOSTOMIA) DINELLA Dall and Bartsch.

- Near Redondo, Cal.: 1 specimen, type. Cat. No. 206938, U.S.N.M.

ODOSTOMIA (ODOSTOMIA) CORONADOENSIS Dall and Bartsch.

- Off Coronado Beach, San Diego, Cal.: 1 specimen, type. 35 fathoms. Cat. No. 206929, U.S.N.M.
2 specimens, topotypes. Kelsey collection.

ODOSTOMIA (ODOSTOMIA) MAMMILLATA Carpenter.

- Mazatlan, Mexico: 1 specimen. Tablet 1957, Liverpool collection, British Museum.

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NEW CYCLOGASTERID FISHES FROM JAPAN.

By C. H. GILBERT and C. V. BURKE,
Of Stanford University, California.

The expedition in 1906 of the Fisheries steamer *Albatross* to the northwest Pacific made notable additions to the cyclogasterid fauna of Bering Sea and Japan. A total of 35 new species were secured, of which 23 were from Japanese waters, and are here described. The family is unquestionably of boreal origin, and is distributed along shore and in moderate depths as far toward the Tropics as the colder currents can be distinctly traced. Farther south, a limited number of species occur at greater depths. The group is richly represented in the Okhotsk Sea, extends its range throughout the Sea of Japan to the Straits of Tsushima, and on the eastern side of Hondo regularly at least as far to the south as Matsushima Bay. Beyond this point northern species are not known to extend, but two peculiar gigantic forms (*Cyclogaster owstoni* and *Cyclogaster tanakae*) appear in Sagami Bay at depths which have not been determined. This occurrence is paralleled among the Cottoids (also a boreal group) in the appearance of the peculiar genera *Silengis*, *Schmidtina*, and *Daruma* in Sagami and Suruga Bays, well to the southward of the area of common distribution of the northern genera. The cyclogasterids are represented farther to the south in Japanese waters by two forms, *Careproctus rhodomelas* and *Paraliparis atramentatus*, which were obtained along the margins of the Kuro Siwo at depths of 405 and 649 fathoms, and were taken with assemblages of forms belonging to a strictly tropical deep-sea fauna. A similar distribution is shown also in the eastern Pacific, where *Paraliparis* invades the deep waters of the Tropics, and is represented by several species which are strictly confined to the deep-sea tropical fauna.

There are here recorded from Japanese waters (including the Okhotsk Sea) 31 species of cyclogasterids, of which only 4 are known to extend their range as far as Bering Sea, and one of the four is a pelagic form of general distribution in the north Pacific. Bering Sea, on the other hand, has approximately 25 species which are unrecorded from the southwest. After making all necessary allowance for the imperfect surveys of these regions, it appears obvious

that so far as the cyclogasterids are concerned, a sharp line separates the fauna of Bering Sea from that of the Okhotsk and the seas to the south.

Within the Japanese area, while data are still incomplete, a faunal line of some value appears to separate the inclosed Sea of Japan (including the Gulf of Tartary) from the Okhotsk Sea and the eastern shores generally. As is shown in the following table of distribution, 12 species are recorded from the Sea of Japan and 24 species from the Okhotsk and the eastern shores of Hokkaido and Hondo; and but five of these are known to occur in both districts. Further exploration will increase the distribution of many of these species, but can hardly obliterate the faunal distinction which here seems apparent.

The types of the new species here described are all deposited in the United States National Museum.*

The drawings are by Mr. W. S. Atkinson.

Table of distribution of Japanese Cyclogasterids.

[Names in brackets are of species previously known.]

Name.	Sea of Japan.	Okhotsk and eastern coast.	Bering Sea.	Depth.
1. <i>Cyclogaster curilenensis</i>		X		Shore.
2. <i>Cyclogaster simushiræ</i>		X		Shore.
3. <i>Cyclogaster tessellatus</i>	X	X		61 to 150 fathoms.
4. <i>Cyclogaster [agassizii]</i>	X	X		Shore to 47 fathoms.
5. <i>Cyclogaster frenatus</i>	X			207 fathoms.
6. <i>Cyclogaster tanaka</i>	X	X		Unknown.
7. <i>Cyclogaster [owstoni]</i>		X		Unknown.
8. <i>Cyclogaster [ochotensis]</i>		X		21 to 75 fathoms.
9. <i>Cyclogaster ingens</i>	X			260 fathoms.
10. <i>Careproctus [cypselurus]</i>			X	510 fathoms.
11. <i>Careproctus rustrinus</i>		X		73 to 119 fathoms.
12. <i>Careproctus acanthodes</i>	X			318 fathoms.
13. <i>Careproctus trachysoma</i>	X			243 to 429 fathoms.
14. <i>Careproctus rhodomelas</i>		X		405 to 507 fathoms.
15. <i>Careproctus pellucidus</i>		X		129 to 153 fathoms.
16. <i>Careproctus sepallensis</i>		X		119 fathoms.
17. <i>Careproctus bathycastus</i>		X		1,900 fathoms.
18. <i>Careproctus roseofuscus</i>		X		100 to 119 fathoms.
19. <i>Careproctus [colleti]</i>	X	X	X	390 to 440 fathoms.
20. <i>Careproctus sinensis</i>	X			200 fathoms.
21. <i>Careproctus pycnosoma</i>		X		229 fathoms.
22. <i>Careproctus curilanus</i>		X		229 fathoms.
23. <i>Careproctus homopterus</i>		X		440 fathoms.
24. <i>Careproctus entomelas</i>	X			428 fathoms.
25. <i>Careproctus entargyreus</i>	X			35 to 66 fathoms.
26. <i>Crysalidius [maizukimai]</i>	X	X		52 to 200 fathoms.
27. <i>Paraliparis atremmentatus</i>		X		649 fathoms.
28. <i>Paraliparis melanobranchus</i>		X		440 fathoms.
29. <i>Paraliparis entochloris</i>		X		100 fathoms.
30. <i>Rhinoliparis [barbulifer]</i>		X	X	192 to 359 fathoms.
31. <i>Nectoliparis [pelagicus]</i>		X	X	269 to 533 fathoms.

KEY TO JAPANESE SPECIES OF CYCLOGASTER.

a¹. Anterior portion of dorsal separated from remainder of fin by a deep notch.

b¹. Gill slit extending downward to opposite base of upper pectoral ray only; pyloric cæca about 70; diameter of disk half length of head; dorsal 34; anal 26; pectoral 29.....*curilenensis*, 1.

b². Gill slit extending downward to opposite base of fourth pectoral ray; diameter of disk much less than half length of head; dorsal 44; anal 34; pectoral 40,*simushiræ*, 2.

*a*². Dorsal not notched anteriorly.

*c*¹. Last dorsal and anal rays not shortened to form a definite notch at union with caudal (sometimes one or both slightly shortened in *C. agassizii*).

*d*¹. Caudal broadly joined by basal half or three-fourths to dorsal and anal.

*e*¹. Gill slit very wide, reaching level of sixteenth pectoral ray; diameter of disk less than one-third length of head, widely separated from vent, which is nearer origin of anal fin; dorsal 48; anal 37; pectoral 35.....*tessellatus*, 3.

*e*². Gill slit narrower, reaching level of eighth or ninth pectoral ray; head very broad, depressed; eye very small, less than half interorbital width; diameter of disk nearly half head, separated from vent by its own diameter or more; dorsal 44; anal 34; pectoral 34.....*agassizii*, 4.

*d*². Caudal very narrowly joined to dorsal and anal, by not more than its basal fifth; head narrow, compressed; diameter of eye nearly three-fourths interorbital width; diameter of disk about two-fifths length of head, separated from vent by a distance less than its own diameter; dorsal 37; anal 31; pectoral 34.....*frenatus*, 5.

*c*². Last dorsal and anal rays shortened, forming a distinct notch at union with caudal.

*f*¹. Pectoral not notched (at least in adults).

*g*¹. Head flattened in the nasal region, snout low and projecting; gill slit reaching level of tenth or eleventh pectoral ray; dorsal and anal joined to basal two-thirds of caudal; diameter of disk less than half length of head, widely separated from vent, which is nearer origin of anal fin; dorsal 45; anal 34; pectoral 41.....*tanaka*, 6.

*g*². Head very convex and rounded in the nasal region; snout deep and short, not projecting; gill slit extending to level of tenth or eleventh pectoral ray; diameter of disk 2½ in head, widely separated from vent; dorsal 43; anal 36; pectoral 40.....*ovstoni*, 7.

*f*². Pectoral notched; gill slit extending down to opposite sixteenth or eighteenth pectoral ray; diameter of disk less than half length of head, separated from vent by a distance about equaling its own diameter; dorsal 45 to 47; anal 36 or 37; pectoral 42.

*h*¹. Body stout, the depth 2.8 in length; jaws nearly equal; often with parallel black stripes; depth 40 to 75 fathoms.....*ochotensis*, 8.

*h*². Body slender, the depth 3.3 in length; upper jaw much projecting, exposing nearly all the upper teeth anteriorly; no black stripes; depth 250 fathoms.....*ingens*, 9.

1. CYCLOGASTER (NEOLIPARIS) CURILENSIS, new species.

Plate 41, fig. 1.

Type.—Cat. No. 73326, U.S.N.M. A female, 110 mm. in total length, from Milne Bay, Simushir Island, Japan.

Closely related to *C. callyodon*, from which it differs in the larger disk and the vent more posterior in position.

Measurements in hundredths of total length excluding the caudal fin: Length of head 29; greatest width of head 24.5; greatest depth of head opposite gill slit 22; greatest depth of body 25; depth of caudal peduncle 9; interocular width 10; diameter of eye 4; width at angles of mouth 15; distance from tip of snout to end of maxillary 12; length of gill slit 6; distance from tip of snout

to disk 17; to anus 38; diameter of disk 15; distance from disk to anus 7; anus to front of anal fin 15; length of longest pectoral ray 15; of longest ray of lower lobe 12; of shortest ray in notch 8.

Dorsal 34; anal 26; pectoral 29; pyloric cæca about 70.

Head and body as in *C. callyodon*; head depressed, the width greater than the depth; profile depressed above the eyes; maxillary reaching vertical from anterior half of eye; snout depressed; jaws about equal. Teeth as in *C. callyodon*, in about nine oblique rows in the half of each jaw. Anterior nostril in a prominent tube; posterior nostril with a raised rim, the anterior outer margin of rim raised to form a narrow pointed flap. Gill slit small, extending downward to opposite the base of the upper pectoral ray.

The anterior nine dorsal rays unsegmented, the first five set off by a notch. Caudal truncate, dorsal and anal connected to it slightly or not at all. Pectoral with a shallow notch, the lower lobe consisting of six rays, not reaching posterior margin of disk. Disk larger than in *C. callyodon*, its diameter slightly more than half length of head, equaling the distance from vent to front of anal fin. (Fig. 1.)

FIG. 1.—RELATIVE SIZE AND POSITION OF VENT AND DISK OF CYCLOGASTER CUBILENSIS.

Coloration resembling that of *C. callyodon*, but with the bars on fins and body often more pronounced and the spotted coloration sometimes seen in *C. callyodon* wholly lacking. Dark above, with an indistinct mottling of slate and ashy gray, the lower surfaces paler; pectorals with two or three dusky cross-bars; dorsal with twelve dusky bars, the posterior nine or ten extending across the body and on the anal fin; caudal with three or four irregular bars; in many specimens the bars are present only on the fins, leaving the body a uniform olive brown or slate color, and in some individuals even the bars on the fins are very indistinct or wanting.

In addition to the type, 31 specimens were taken in the tide pools at Milne Bay, Simushir Island.

2. CYCLOGASTER (NEOLIPARIS) SIMUSHIRÆ, new species.

Plate 41, fig. 2.

Type.—Cat. No. 73327, U.S.N.M. A male, 138 mm. in total length, from Milne Bay, Simushir Island, Japan.

Closely related to *C. greeniei*, differing in the more numerous fin rays, in the shape of the head and body, and in the vent being nearer the disk.

Measurements in hundredths of length exclusive of caudal fin (120 mm.): Length of head 29.5; depth opposite front of disk 18.5; depth opposite gill slit 25; greatest width of head 24; greatest depth of body 25; depth of caudal peduncle 7; interocular width 12.5;

diameter of eye 4; width at angles of mouth 17.5; distance from tip of snout to end of maxillary 15; length of gill slit 7.5; distance from tip of snout to disk 18; to anus 38; diameter of disk 11; distance from disk to anus 9.5; from anus to front of anal fin 9.5; length of longest pectoral ray 16.5; of shortest ray in notch 8.

Dorsal 44; anal 34; pectoral 40.

Body deepest in front of dorsal, tapering rapidly backward from middle of second dorsal. Head thick, only moderately depressed, its width greater than its depth; cheeks swollen; maxillary reaching vertical from posterior margin of eye; anterior nostril in a thick tube; posterior nostril without a tube. Teeth weakly trilobed, in about ten oblique rows in the half of each jaw. Gill slit extending down in front of four pectoral rays.

First seven dorsal rays separated off by a deep notch; caudal truncate; anal joined to caudal for not more than one-seventh of the length of the caudal; dorsal only slightly connected to the caudal; pectoral notched, the lower lobe consisting of seven rays and extending slightly past disk. Vent separated from disk by diameter of disk.

Color olive brown above and on sides, paler below; fins unmarked, colored the same as the body.

In addition to the type, two young cotypes 28 mm. long were obtained in the same locality. In these the vent is much farther back, almost immediately in front of the origin of the anal. One of the cotypes has large scattered papillæ, most numerous on upper anterior part of trunk. These may develop "thumb-tacks" in adults.

3. *CYCLOGASTER TESSELLATUS*, new species.

Plate 41, fig. 3.

Type.—Cat. No. 73328, U.S.N.M., a male, 186 mm. long, from station 5042, off the southeast coast of Hokkaido, west of Erimo Saki; depth 61 fathoms.

Measurements in hundredths of total length exclusive of caudal fin (158 mm.): Length of head 26; depth opposite front of disk 16; opposite gill slit 20; greatest width of head 17.5; greatest depth of body 23; depth of caudal peduncle 3; interocular width 11.5; diameter of eye 4.5; width at angles of mouth 12.5; distance from tip of snout to end of maxillary 13; length of gill slit 11.5; distance from tip of snout to disk 15; to anus 37; diameter of disk 8; distance from disk to anus 14; from anus to front of anal fin 4.5; from tip of snout to front of dorsal 28; longest pectoral ray 24; longest ray of lower lobe 18; shortest ray in notch 11.

Dorsal 48; anal 37; pectoral 35.

Body elongate, slender. Head pointed, broad and flat between the eyes; occiput not swollen; depth of head greater than width. Snout depressed, rising gradually, projecting beyond the premaxil-

laries for nearly the diameter of the eye; lower jaw included; anterior nostril in a very short tube; posterior nostril reduced to a small pore; maxillary reaching vertical from middle of eye. Teeth in moderate bands, arranged in about fifteen oblique rows in the half of the lower jaw and twenty in the half of the upper. Gill opening large, extending down in front of sixteen pectoral rays. Caudal elongate, slightly rounded, joined to dorsal and anal for three-fourths its length, the rays evenly graduated, the union without notch. Pectoral notched, the lower lobe consisting of five rays and reaching more than half way from disk to vent. Disk rather small, widely separated from the vent, which is but little in advance of the origin of the anal. (Fig. 2.)

Top and sides of head and body dusted and marbled with dark brown; abdomen and throat pale or pinkish; pectoral a little darker than the body, with irregular dusky bars above; anterior margin of dorsal with dark blotches; posteriorly these are replaced by dark bars which zigzag obliquely downwards across the fin; anal a little darker than dorsal, crossed by about seven pairs of narrow dusky bars, inclosing each a wider light bar; caudal with three oblique bars; peritoneum silvery, with dark spots.

FIG. 2.—RELATIVE SIZE AND POSITION OF VENT AND DISK OF *CYCLOGASTER TESSELLATUS*.

Resembling *C. pulchellus* in the wide connection between the vertical fins, but the gill slit much wider.

In addition to the type, two cotypes were taken at station 5041 in the same locality, at a depth of 140 fathoms; and one at station 4867, in the Sea of Japan, off the coast of Korea, depth 150 fathoms.

4. *CYCLOGASTER AGASSIZII* (Putnam).

Liparis agassizii PUTNAM, Proc. Amer. Ass. Adv. Sci., 1874, p. 339 (Gulf of Tartary).

Abundant in tide pools and along shore throughout northern Japan. It was taken but once with the dredge, at station 4808, Straits of Tsugaru, Japan, at a depth of 47 fathoms. Like many other northern shore forms, its southern distribution is determined by that of the cold current, which can be detected a little beyond Matsushima Bay.

5. *CYCLOGASTER FRENATUS*, new species.

Plate 42, fig. 1.

Type.—Cat. No. 73329, U.S.N.M., 94 mm. long, from station 4809, in the Sea of Japan, off the northwest coast of Hondo; depth 207 fathoms.

Measurements in hundredths of total length, exclusive of caudal fin (78 mm.): Length of head 25; depth opposite front of disk 14.5; opposite gill slit 20; greatest width of head 18; greatest depth of body

25; depth of caudal peduncle 6; interocular width 8; diameter of eye 5.5; width at angles of mouth 11; distance from tip of snout to end of maxillary 9; length of gill slit 8; distance from tip of snout to disk 14; to anus 32.5; diameter of disk 10; distance from disk to anus 7; from anus to front of anal fin 15; distance from tip of snout to front of dorsal 32; longest pectoral ray of upper lobe 17; of lower lobe 17; shortest ray in notch 10.

Dorsal 37; anal 31; pectoral 34.

Body not deep, compressed. Head rather slender and pointed, compressed; interorbital flat; cheeks not swollen; sides of head nearly vertical. Mouth small, narrow, with little lateral cleft; maxillary reaching vertical from front of eye. Teeth stout, strongly trilobed, about eight rows in the half of each jaw. Snout rather deep, slightly overlapping the mouth. Posterior nostril with a raised rim, which is produced into a short flap in front; anterior nostril in a long tube, which when depressed nearly reaches posterior nostril. Gill opening extending down in front of the upper nine pectoral rays.

Anterior dorsal rays rather stiff, the first six unsegmented. Caudal truncate, consisting of ten stout rays; dorsal and anal connected to caudal for a short distance, the anal connection a little greater than the dorsal; last rays of dorsal and anal connected to their tips to the caudal. Disk rather small, with a broad flap. Vent close behind disk, distant from it less than the diameter of the disk. Pectoral notched, the lower lobe of seven rays, its tip reaching vent.

Coloration: Skin with fine dark brown dots, more numerous on the top of the head, absent from the abdomen; a dark streak running forward and downward from the eye; dark spots extending backward from end of maxillary; pectoral with a broken dark bar near base, the remainder of fin pale; about seven faint dusky bars on dorsal and anal, the posterior bars extending farther on peduncle; a narrow black bar across base of caudal, a second, less marked, two-thirds the distance to the tip. In life, the fins and the lower jaw light red, the body grayish.

Apparently related to *C. cyclopus*, but not closely so, and easily distinguished by the shape of the head and the number of the fin rays.

Only the type taken.

6. CYCLOGASTER TANAKAE, new species.

Plate 42, fig. 2.

Liparis owstoni TANAKA, Journ. Sci. Coll. Imp. Univ. Tokyo, vol. 23, 1908, p. 45, pl. 3, fig. 2; not *Trismegistus owstoni* Jordan and Snyder.

Type.—360 mm. long, from Vries Island, Sagami Sea, Japan. Presented to Stanford University by Shigeho Tanaka, of the Imperial University of Japan.

Measurements in hundredths of total length exclusive of caudal fin: Length of head 28; depth opposite gill slit 22; greatest width of

head 22; greatest depth of body 24; depth of caudal peduncle 4.5; interocular width 13; diameter of eye 3; width at angles of mouth 18; distance from tip of snout to end of maxillary 14; length of gill slit 10.5; distance from tip of snout to disk 13; to anus 39; diameter of disk 11.5; distance from disk to anus 15; from anus to front of dorsal 31; longest pectoral ray .25; longest ray of lower lobe 15; shortest pectoral ray 15.

Dorsal 45; anal 34; pectoral 41.

Body heavy anteriorly, not very deep. Head broad and depressed, about as broad as deep, nearly quadrate in cross section; profile almost straight from occiput to snout. Snout depressed, broadly rounded; upper jaw projecting so that the upper band of teeth is partly exposed. Eye very small. Anterior nostril in a short thick tube, posterior with a slightly projecting rim. Mouth very broad, its angle behind vertical from anterior nostril; maxillary reaching vertical from middle of eye. Teeth strongly trilobed, in about 30 oblique rows in the half of the upper jaw; outer teeth smaller and not so strongly trilobed. Gill slit extending down in front of 11 pectoral rays.

Caudal slightly rounded, the dorsal and anal joined with its basal two-thirds, the last dorsal and anal rays shortened, forming rounded lobes. Pectoral broad, not notched, the lower lobe broadly rounded, its upper rays not shortened. Disk large, oval, its anterior edge below the eye. Vent far back, nearer anal fin than disk.

Coloration: Pale gray with dusky mottlings and stripes along base of dorsal and top of body; margin of dorsal, anal, pectoral, and the caudal dusky; posterior surface of pectoral dusky; free tips of all rays whitish; a white line where the skin of the body is firmly attached to the vertical fins, this most pronounced on the caudal.

Thumb-tack prickles on the top and sides of head and body, apparently absent on throat and abdomen.

C. tanakæ can be distinguished from *C. owstoni* by the broad depressed snout. They both agree in the character of the caudal and pectoral fins, which distinguish them from the other species of the genus.

Five specimens of this species were in the collections of the Imperial University of Japan, three of these from the vicinity of Vries Island, Sagami Sea, taken in the spring of 1906, the other two probably from the same locality. An additional specimen has been recently taken at Fusan, Korea, by Dr. David Starr Jordan.

7. CYCLOGASTER OWSTONI (Jordan and Snyder).

Trismegistus owstoni JORDAN and SNYDER, Smiths. Misc. Coll., vol. 45, 1904, p. 238, pl. 58 (Sagami Bay).

No additional specimens were secured of this interesting species, which is known only from the type, and from a specimen from the market at Nagasaki recorded by Schmidt.¹

¹ Proc. U. S. Nat. Mus., vol. 28, 1904, p. 189.

8. CYCLOGASTER OCHOTENSIS (Schmidt).

Plate 42, fig. 3.

Liparis ochotensis SCHMIDT, Pisces Marium Orientalium, 1904, p. 163 (Okhotsk Sea).

The following description will serve for comparison with other allied species of our collection:

Head 3.3 in length; depth 2.8. Dorsal 45; anal 36; pectoral 42. Eye 8.8 in head; snout 2.6; gill slit 2.2; disk 2.5; pyloric cæca 23.

Body heavy and deep anteriorly, tapering rapidly to the caudal, the greatest depth at shoulders. Head short and deep, the occiput slightly swollen, the profile steep; interorbital space broad; the distance between the anterior nostrils contained 3.6 times in the head. Snout short and broad, rising abruptly; jaws equal. Anterior nostrils in a prominent tube; posterior nostril with a raised rim. Eye small, round. Mouth broad; maxillary reaching vertical from just behind the eye. Teeth slender, weakly trilobed, in a broad band, arranged in about 25 oblique rows in the half of each jaw, those of the anterior series minute. Gill slit broad, extending down in front of 18 pectoral rays.

Anterior dorsal rays buried in a gelatinous tissue; distance from tip of snout to dorsal 2.8 in body. Caudal broad, slightly rounded. Dorsal and anal joined to basal half of caudal, the anal a little more widely joined than the dorsal; last rays of both dorsal and anal shortened, forming rounded lobes, pectoral broad, notched; the lower lobe thickened, with partly free rays reaching two-thirds the distance from disk to vent. Disk nearly round; distance from tip of lower jaw to disk 8.4 in length; from disk to origin of anal 4.8. Vent separated from disk by a little less than diameter of disk.

Coloration: Top of head and sides and back of body with bluish black stripes, these darker along the edges and sometimes dividing posteriorly to form two stripes; lower parts of body pale; margin of pectoral, dorsal, and anal bluish black; caudal blackish; lower lobe of pectoral not so dark as the upper.

Thumb-tack prickles on top of head and on back; those on sides smaller; lower surfaces smooth.

This species differs from *C. agassizii* in the increased number of pectoral rays. The description is from a female specimen 465 mm. long, from station 5008, in Aniva Bay, Sagalin Island, at a depth of .40 fathoms. Young specimens were taken in the same locality at stations 5010 and 5012, depths 21 and 42 fathoms; and others from stations 5016, 5017, 5020, 5021, and 5023, off the eastern coast of Sagalin, at depths of 64 to 75 fathoms.

As in certain other species of the genus, *C. ochotensis* displays distinct color patterns. Certain of our specimens are conspicuously marked with longitudinal black streaks, others with light blotches of varying size and shape, narrowly margined with dusky, while the majority are gray, finely spotted or variegated with darker.

9. *CYCLOGASTER INGENS*, new species.

Plate 43, fig. 1.

Type.—Cat. No. 73330, U.S.N.M. A male, 490 mm. long, from station 4863, off the coast of Korea, in the Sea of Japan; depth 250 fathoms.

Measurements in hundredths of total length, excluding the caudal fin (410 mm.): Length of head 31.5; depth opposite front of disk 25.5; opposite gill slit 30; greatest width of head 24.5; greatest depth of body 30; depth of caudal peduncle 4; interocular width 12; diameter of eye 3; width at angles of mouth 18.5; distance from tip of snout to end of maxillary 16.5; length of gill slit 14; distance from tip of snout to disk 18.5; to anus 38.5; diameter of disk 11; distance from disk to anus 9.6; from anus to front of anal fin 8.5; from tip of snout to front of dorsal 34; longest pectoral ray 22; longest ray of lower lobe 18; shortest ray in notch.

Dorsal 45; anal 37; pectoral 42.

Body deepest at union with head, rather elongate and weak posteriorly and much compressed; head heavy, occiput swollen, profile rising very obliquely from snout; cheeks slightly swollen; snout short, deep, rising abruptly; upper jaw projecting so that nearly all the upper teeth are exposed; anterior nostril in a short wide tube; eye small; mouth wide; maxillary reaching vertical from slightly behind eye; posterior teeth slender, depressible and weakly trilobed, the anterior teeth becoming progressively smaller, those along the front of each jaw extremely minute; about 20 oblique rows in the half of the lower jaw and 30 in the upper. Gill slit wide, extending down in front of 16 pectoral rays.

Origin of dorsal slightly behind tip of gill flap. Caudal injured, its union with dorsal and anal apparently equal to half or more than half of its length. Pectoral notched, the lower lobe reaching two-thirds the distance from the disk to the vent. Disk rather large, separated from vent by a distance nearly equal to its own diameter.

Body and vertical fins dusky, with bluish black mottlings; margin and posterior surface of head and body pale.

Minute thumb-tack prickles sparsely distributed on top of head, on dorsal fin, and on sides of body; lower parts, including anal fin and a strip along its base, the terminal part of snout, lower part of cheeks and opercles, the pectoral fin and its axil naked.

This species differs from *C. ochotensis* in having a shorter jaw and a longer slenderer body. It appears to have more oblique series of teeth in the upper jaw than in the lower (30–20), while *C. ochotensis* has about the same number (25) in each jaw; but this may have little significance, as in these species the total number of rows in adults has been increased by the more or less irregular intercalation of secondary rows. *Ingens* is a deep-water species (250 fathoms) from off the Korean coast. The form is more slender and the texture less

firm than in *C. ochotensis*, which is a sublittoral species known only from Sagalin. In other structural details, the two species agree closely.

Only the type known.

KEY TO JAPANESE SPECIES OF CAREPROCTUS.

- a¹. Caudal deeply and sharply forked *cypselurus*, 10.
- a². Caudal not deeply forked—either gently concave, truncate, or convexly rounded.
 - b¹. Head and body rough with thick-set multifid prickles.
 - c¹. Length of head more than one-fourth the total length; peritoneum silvery, not dotted with black.
 - d¹. Diameter of disk about one-tenth length of head; body slender, its depth much less than one-third the total length..... *rastrinus*, 11.
 - d². Diameter of disk about one-sixth length of head; body deeper, its depth much more than one-third the total length *acanthodes*, 12.
 - c². Length of head less than one-fourth the total length; diameter of disk about one-ninth the length of head; body slender, the depth less than one-third the total length..... *trachysoma*, 13.
 - b². Head and body smooth, or with widely scattered simple prickles.
 - e¹. Gill slit extending below level of upper pectoral ray.
 - f¹. Teeth coarse, trilobed; gill slit extending to opposite third pectoral ray..... *rhodomelas*, 14.
 - f². Teeth simple; gill slit extending to opposite fifth or sixth pectoral ray. *pellucidus*, 15.
 - e². Gill slit usually confined to area above base of pectoral, rarely extending to level of first or second pectoral ray.
 - g¹. Diameter of ventral disk less than one-fourth length of head.
 - h¹. Teeth trilobate, some of the outer teeth simple; in life, transparent, with a reddish tinge, slightly dusky posteriorly; lower pectoral lobe short..... *segaliensis*, 16.
 - h². Teeth simple.
 - i¹. Uniform jet-black, including gill cavity and peritoneum; distance from disk to anus nearly twice the diameter of disk. *bathycætus*, 17.
 - i². Not wholly black.
 - k¹. Distance from disk to anus slightly greater than diameter of disk; lower lobe of pectoral scarcely reaching vent. *roseofuscus*, 181
 - k². Distance from disk to anus half diameter of disk; lower pectoral lobe long, extending beyond origin of anal fin.... *colletti*, 19.
 - g². Diameter of ventral disk more than one-fourth length of head.
 - l¹. Teeth trilobate (weakly so in *C. sinensis*).
 - m¹. Body deep and compressed, the depth more than one-fourth the length; texture somewhat gelatinous. *sinensis*, 20.
 - m². Body elongate, the depth not exceeding one-fifth the length.
 - n¹. Head more than one-fourth the length... *pycnosoma*, 21.
 - n². Head less than one-fourth the length... *curilanus*, 22.
 - l². Teeth simple (a few with weak lobes in *C. homopterus*).
 - o¹. Pectoral indistinctly notched, none of the lower rays extending beyond the disk..... *homopterus*, 23.
 - o². Pectoral distinctly notched, with well-developed lower lobe.
 - p¹. Peritoneum jet black..... *entomelas*, 24.
 - p². Peritoneum silvery, with scattered black dots. *entargyreus*, 25.

10. CAREPROCTUS CYPSELURUS (Jordan and Gilbert).

Prognurus cypselurus JORDAN and GILBERT, Fishes of Bering Sea. Report Fur Seal Investigations, Part 3, 1899, p. 478, pl. 77 (Bering Sea).

One specimen 260 mm. in length from station 5015, in the southern part of the Okhotsk Sea, at a depth of 510 fathoms.

Color in life: Greater part of head, body, and fins deep purplish indigo, the anterior part of the sides almost clear red, with little blue; head again becoming deeper blue, but with more red than the posterior part of the trunk; basal portion of upper pectoral rays also with more reddish.

11. CAREPROCTUS RASTRINUS, new species.

Plate 43, fig. 2.

Type.—Cat. No. 73331, U.S.N.M. A female, length 285 mm. long, from station 5026, in the southern part of the Okhotsk Sea, depth 119 fathoms.

Measurements in hundredths of length without caudal (259 mm.): Length of head 27.5; greatest width of head 17.5; interocular width

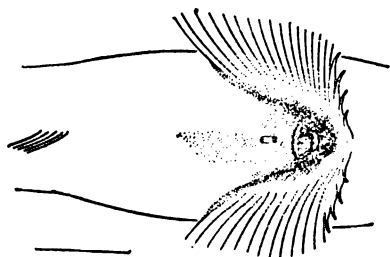


FIG. 3.—RELATIVE SIZE AND POSITION OF VENT AND DISK OF CAREPROCTUS RASTRINUS.

16; width at angles of mouth 15; distance from tip of snout to front of orbit 11; diameter of eye 5.5; distance from tip of snout to end of maxillary 14; length of gill slit 8; greatest depth of body 42; distance from tip of snout to front of disk 14; to anus 17.2; to front of anal fin 38; to front of dorsal 29.5; diameter of disk 2.5; distance from disk to anus 2; longest pectoral ray

of upper lobe 15; of lower lobe 29; shortest ray 8.

Dorsal 59; anal 52; pectoral 37; caudal 8; pyloric cæca 34.

Body heavy and deep anteriorly, compressed, tapering rapidly to caudal. Head short, with short blunt snout; profile evenly rounded, the anterior profile of snout vertical; interorbital wide, nearly thrice eye; cheeks vertical; jaws equal; nostril in a short wide tube on lower line of eye. Mouth wide; maxillary reaching vertical from slightly behind eye. Teeth stout, blunt, simple, arranged in about 11 oblique rows in the half of each jaw. Gill slit extending down in front of four or five pectoral rays.

Origin of dorsal far forward, a little in front of gill slit. Caudal broad, slightly rounded, joined to anal a little more than half its length; no dorsal or anal notch. Pectoral deeply notched; the upper lobe reaching past front of anal; the lower lobe of eight greatly exserted rays, the longest reaching front of anal and nearly as long as head

(shorter in cotypes). Disk small, broadly triangular in the adult, this scarcely evident in the younger cotypes; vent close behind disk. (Fig. 3.)

Multifid prickles scattered thickly over head and body.

Color in life, light yellowish pink or salmon color, nearly white on belly and under side of head; peritoneum silvery.

This species is not closely related to the other species of the genus; it is readily distinguished by the short heavy head and body and the coloration.

Two cotypes from station 5021, off Cape Patience, Sagalin, depth 73 fathoms.

12. CAREPROCTUS ACANTHODES, new species.

Plate 43, fig. 3.

Type.—Cat. No. 73332, U.S.N.M. A female, 89 mm. long, from station 4997, in the Gulf of Tartary; depth 318 fathoms.

Measurements in hundredths of length without caudal (81 mm.): Length of head 29.5; greatest width of head at cheeks 17; interocular width at angles of mouth 15.5; distance from tip of snout to front of orbit 12.5; diameter of eye 8; distance from tip of snout to end of maxillary 12.5; length of gill slit 5.8; greatest depth of body 27; distance from tip of snout to front of disk 12.8; to anus 17; to front of anal fin 35; to front of dorsal 28; diameter of disk 5; distance from disk to anus 1.3; longest pectoral ray of upper lobe 21.5; of lower lobe 12.8; shortest ray in notch 5.5.

Dorsal 53; anal 46; pectoral 33; pyloric cæca 19.

Body moderately deep, compressed, much more elongate than in *C. rastrinus*. Head very wide, blunt and heavy, cheeks vertical, interorbital broad and flat. Snout short, wide, and deep, scarcely protruding; jaws equal; nostril in a short broad tube in front of lower edge of pupil; eye moderate, the lower half silvery. Mouth broad; maxillary reaching vertical from posterior margin of pupil. Teeth short, simple, arranged in 10 or 11 oblique rows in the half of each jaw. Gill slit extending down in front of upper pectoral ray, or in some cases confined to area above base of fin, this variation apparently due to looseness of the integument.

Origin of dorsal above tip of gill flap; anterior dorsal rays buried in a gelatinous tissue. Caudal truncate, joined to anal for nearly half its length; no dorsal or anal notch. Pectoral notched, the upper lobe reaching past front of anal; lower lobe of six rays, short, reaching

FIG. 4.—RELATIVE SIZE AND POSITION OF VENT AND DISK OF CAREPROCTUS ACANTHODES.

little past vent. Disk small, deeply cupped, appearing somewhat triangular in the larger individuals; vent close behind disk. (Fig. 4.)

Multifid prickles scattered over head and body, absent on lips and chin, few or none near the caudal.

Skin transparent, finely dusted with dark brown dots, body dusky along the back, abdomen silvery, lower half of eye and peritoneum silvery.

In appearance this species resembles *C. trachysoma*, but can be distinguished by the color of the peritoneum, the shorter pectoral lobe, and the larger disk.

Four cotypes were taken with the type.

13. CAREPROCTUS TRACHYSOMA, new species.

Plate 44, fig. 1.

Type.—Cat. No. 73333, U.S.N.M. A male, 266 mm. long, from station 4982, in the northern part of the Japan Sea; depth 390 fathoms.

Measurements in hundredths of length without caudal (243 mm.): Length of head 22.2; greatest width of head at cheeks 14; interocular width 12; width at angles of mouth 11; distance from tip of snout to front of orbit 7.1; diameter of eye 5; distance from tip of snout to end of maxillary 11; length of gill slit 6.5; greatest depth of body (not including vertical fins) 30; distance from tip of snout to front of anal fin 32.5; to front of disk 11.3; to anus 14.5; to front of dorsal

FIG. 5.—RELATIVE SIZE AND POSITION OF VENT AND DISK OF CAREPROCTUS TRACHYSOMA.

25.5; diameter of disk 2.3; distance disk to anus 1.5; longest pectoral ray of upper lobe 16; of lower lobe 23; shortest ray in notch 8.

Dorsal 60; anal 55; pectoral 31 (fin counts from cotype).

Body deep and compressed. Head short, deep, compressed, the anterior profile steep, the sides vertical. Snout short, blunt, rising rapidly, not projecting; upper jaw slightly protruding beyond the lower; nostril in a short tube in front of eye, below level of pupil. Mouth broad, with considerable lateral cleft, the maxillary reaching vertical from behind pupil. Teeth simple, short, in narrow bands. Gill slit extending down in front of five pectoral rays in type; in some of the cotypes not extending down so far in front of the fin.

Origin of dorsal above opercular flap, the rays increasing gradually in length and buried in a gelatinous tissue. Caudal truncate or slightly rounded, of eight rays, joined to anal for nearly half its length; dorsal and anal connected to caudal abruptly, but there is no

notch between the fins. Pectoral notched, the upper lobe reaching third anal ray; lower lobe of eight rays, elongate, reaching nearly to anal, in adults greater than length of head, in young a little less than head. Disk small, hidden beneath the lower pectoral lobes; in adults the posterior and anterior parts of the flap are folded over the base of the disk, so that the width appears greater than the length. Vent close behind disk. (Fig. 5.)

Multifid prickles scattered thickly over head and body, with the exception of the lips and chin; usually about 10 slender prickles clustered about a single base. (Fig. 6.)

Color dusky, faintly pinkish in life, darker on top of head in the type; dorsal and anal posteriorly and the caudal bluish black; pectoral dusky except at base; skin everywhere dusted with fine dark dots; peritoneum silvery, with fine dark dots.

Twelve cotypes were taken from the following stations:

	Fathoms.
4814. Off Sado Island, Sea of Japan.....	429
4981. Shiruunku Bay, west coast Hokkaido.....	406
4982. Shiruunku Bay, west coast Hokkaido.....	390
4983. Shiruunku Bay, west coast Hokkaido.....	428
4992. Off the northwest coast of Hokkaido.....	325
4997. Gulf of Tartary.....	318

Differing from *C. rastrinus* conspicuously in the shorter head, the slenderer form, and the darker coloration.

14. *CAREPROCTUS RHODOMELAS*, new species.

Plate 44, fig. 2.

Type.—Cat. No. 73334, U.S.N.M. A male, 123 mm. long, from station 4958, off the Bungo Channel, Japan; depth 405 fathoms.

Measurements in hundredths of length without caudal (113 mm.): Length of head 19; greatest width of head 14; interocular width 10; width at angles of mouth 8.5; distance from tip of snout to front of orbit 6; diameter of eye 5.5; distance from tip of snout to end of maxillary 8; length of gill slit 5; greatest depth of body 19; distance from tip of snout to front of disk 11.5; to anus 17; to front of anal fin 34; to front of dorsal 23; diameter of disk 3; distance from disk to anus 4; longest pectoral ray of upper lobe 15, of lower lobe 21; shortest ray in notch 4.

Dorsal 56; anal 48; pectoral 31 (from cotype); caudal 9.

Body elongate, slender, compressed, tapering very gradually to the caudal. Head short, flat on top, the sides vertical; interorbital wide; occiput slightly swollen. Snout short and deep, not projecting; nostril in a short tube in front of upper part of eye; mouth

FIG. 6.—SECTION OF SKIN OF *CAREPROCTUS TRACHYSOMA* SHOWING MULTIFID PRICKLES.

broad, maxillary reaching vertical from middle of eye. Teeth very coarse, trilobed, the lateral lobes stout, nearly as long as the middle lobe, the teeth arranged in broad bands, not decreasing regularly in size outward; eight or nine oblique series in half of either jaw. Gill opening extending down in front of three pectoral rays (in cotype, the type mutilated).

Origin of dorsal slightly behind base of pectoral; the anterior rays increasing gradually in length. Caudal rather slender, the tips of the rays coiled and apparently free, its union with anal equal to one-third its length. Pectoral notched, the lower lobe elongate, longer than the upper lobe, reaching nearly to the anal. Disk small, triangular in shape, the flap narrow, but little developed on the sides anteriorly. (Fig. 7.)

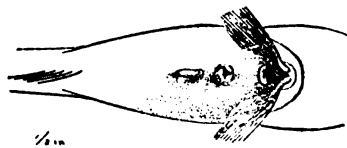


FIG. 7.—RELATIVE SIZE AND POSITION OF VENT AND DISK OF *CAREPROCTUS RHODOMELAS*.

Color in spirits, dusky, jet black anteriorly, where the peritoneum and lining of the gill cavity show through. In life, the head, body, and fins rose red or brick red, brighter anteriorly, except where underlaid by black. Pectoral blackish on inner face proximally.

A well-marked species, distinguished in part by the very coarse teeth and the elongate lower lobe of the pectoral.

A single cotype from station 4980, south of Suruga Bay; depth 507 fathoms.

15. *CAREPROCTUS PELLUCIDUS*, new species.

Plate 44, fig. 3.

Type.—Cat. No. 73335, U.S.N.M. Female, 127 mm. in total length, from station 5048, off Matsushima Bay, east coast of Hondo; depth 129 fathoms.

Measurements in hundredths of length without caudal (115 mm.): Length of head 27; greatest width of head 17; interocular width 17; width at angles of mouth 14; distance from tip of snout to front of orbit 10; diameter of eye 7; distance from tip of snout to end of maxillary 15; greatest depth of body 31; length of gill slit 8; distance from tip of snout to front of disk 16; to anus 20; to front of anal fin 36; to front of dorsal 27; diameter of disk 4; distance from disk to anus 3; longest pectoral ray of upper lobe 16, of lower lobe 24; shortest ray in notch 7.

Dorsal 55; anal 49; pectoral 35; pyloric cæca 18.

Body deep, compressed, short; greatest depth under origin of dorsal. Head wide, flat above, the sides vertical. Snout short, rising abruptly, slightly overlapping the mouth; lower jaw included; nostril in a prominent tube; eye large and prominent. Mouth wide, angle of mouth behind front of eye; maxillary reaching vertical from just in front

of posterior margin of eye. Teeth simple, rather stout, and slightly curved backward, in about 10 oblique rows. Gill slit extending down in front of the upper five or six pectoral rays.

Origin of dorsal far forward, a little in front of gill slit, the anterior rays buried in a pseudotissue. Caudal truncate, joined to dorsal and anal for two-fifths its length, the posterior line of union abrupt but without notch. Pectoral deeply notched; the lower lobe long, of eight deeply exserted rays which reach nearly to anal fin. Base of upper pectoral ray in axis of body, which passes just below eye. Disk small, triangular, separated from vent by slightly less than its diameter. (Fig. 8.)

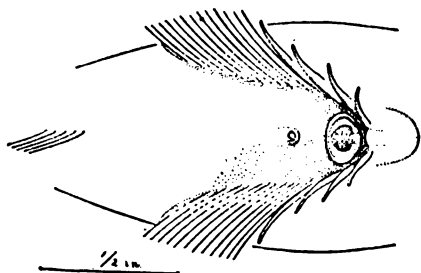


FIG. 8.—RELATIVE SIZE AND POSITION OF VENT AND DISK OF *CAREPROCTUS PELLUCIDUS*.

Color pale, skin transparent in life, tinged with light rose; dark brown dots on body and vertical fins; peritoneum pale.

One cotype from station 5048 and five from station 5049, off Matsushima Bay, east coast of Hondo, in 129 and 182 fathoms.

16. *CAREPROCTUS SEGALIENSIS*, new species.

Plate 45, fig. 1.

Type.—Cat. No. 73336, U.S.N.M. 75 mm. in total length, from station 5026, Okhotsk Sea, off the southern part of Sagalin Island, in the vicinity of Cape Patience; depth 119 fathoms.

Measurements in hundredths of total length excluding the caudal fin (69 mm.): Length of head 22.5; greatest width of head 14; interocular width 12; width at angles of mouth 8.5; distance from tip of snout to front of orbit 10; diameter of eye 5; length of gill slit 3.8; greatest depth of body 24; distance from tip of snout to front of disk

FIG. 9.—RELATIVE SIZE AND POSITION OF VENT AND DISK OF *CAREPROCTUS SEGALIENSIS*.

12.5; to anus 18.5; to front of anal 33; to front of dorsal 28; diameter of disk 4.3; longest pectoral ray of upper lobe 18; of lower lobe 9.5; of shortest ray in notch 7.

Dorsal 58; anal 52; pectoral 25.

Body deep and compressed, as in *C. mirabilis*. Head compressed, sides nearly vertical; profile descending in an even curve; snout not split, projecting beyond upper lip for two-thirds diameter of eye; nostril in a short tube; eye small. Mouth small and narrow; maxillary reaching vertical from pupil. Teeth in broad bands, slender,

with well developed lateral lobes; outer teeth smaller, bluntly pointed and without lateral lobes. Gill slit very narrow, wholly confined to area above pectoral fin.

Anterior dorsal rays free from the skin, enveloped in a pseudotissue. Caudal injured in the type, apparently truncate, of about five rays; anal joined to basal third of caudal; dorsal and anal joining caudal without notch. Pectoral slightly notched, the lower lobe of five rays below notch, the rays short, the longest reaching slightly past vent. Disk rather small, the vent close behind it. (Fig. 9.)

In life transparent, with a reddish tinge, slightly dusky posteriorly, the flesh pinkish.

Resembling *C. mirabilis* in shape of head and body, but distinguished by the number of pectoral rays and the coloration and in the absence of the deep cleft on the snout.

Only the type taken.

17. CAREPROCTUS BATHYCETUS, new species.

Plate 45, fig. 2.

Type.—Cat. No. 73337, U.S.N.M. A female, 181 mm. long, from station 5030, in the southern part of the Okhotsk Sea, depth 1,800 fathoms.

Measurements in hundredths of length without caudal (163 mm.): Length of head 21; greatest width of head 14; interocular width 9; width at angles of mouth 11.5; distance from tip of snout to front of orbit 8; diameter of eye 4.2; distance from tip of snout to end of maxillary 9.2; length of gill slit 5.5; greatest depth of body 17.5; distance from tip of snout to front of disk 13; to anus 21; to front of anal fin 29.5; to front of dorsal 23; diameter of disk 3; distance from disk to anus 5.5; longest pectoral ray of upper lobe 15; of lower lobe 15; shortest ray in notch 3.5.

FIG. 10.—RELATIVE SIZE AND POSITION OF VENT AND DISK OF CAREPROCTUS BATHYCETUS.

Dorsal 61; anal 55; pectoral 23; pyloric cæca 9.

Body deepest at front of dorsal, greatly compressed and rapidly tapering posteriorly. Head short and heavy; occiput slightly swollen; a low median interorbital ridge; width and depth of head about equal. Snout moderately deep, truncate, projecting slightly beyond mouth; nostril in front of middle of eye, provided with a raised rim. Mouth wide, maxillary reaching vertical from posterior margin of pupil. Teeth rather long and slender, somewhat curved, all simple, without trace of lateral lobes, arranged in about 12 oblique rows in the half of each jaw. Gill opening not extending below upper pectoral ray.

Dorsal origin above tip of opercular flap. Caudal slender, apparently with six rays, joined to anal for about one-third its length. Pectoral notched; the lower lobe of six rays reaching halfway between vent and anal. Disk small, rather deeply cupped, placed behind vertical from posterior margin of eye. (Fig. 10.)

Color uniform jet black; mouth dusky; gill cavity and peritoneum also black.

A deep-sea species related to *C. colletti*, distinguished among other characters by the small number of rays in the pectoral fin.

Only the type known.

18. *CAREPROCTUS ROSEOFUSCUS*, new species.

Plate 45, fig. 3.

Type.—Cat. No. 73338, U.S.N.M. Ninety-one mm. long, from station 5026, off the southeastern part of Sagalin Island, vicinity of Cape Patience; depth 119 fathoms.

Measurements in hundredths of total length exclusive of caudal fin (81 mm.): Length of head 26; greatest width of head 18; interocular width 12; width at angles of mouth 10; distance from tip of snout to front of orbit 11.5; diameter of eye 5; distance from tip of snout to end of maxillary 11; length of gill slit 3.1; greatest depth of body 25; distance from tip of snout to front of disk 16; to anus 26; to front of anal fin 35; to front of dorsal 27; diameter of disk 5.5; distance from disk to anus 6; longest pectoral ray of upper lobe 18; of lower lobe 9; shortest ray in notch 7.

Dorsal 57; anal 48; pectoral 30; pyloric caeca 22.

Body deep and compressed, resembling in this respect *C. segaliensis* and *Crystallichthys mirabilis*.

Head short, deep and compressed, its depth greater than its width; interorbital narrow. Snout short, rising abruptly, scarcely overpassing the mouth; jaws equal; nostril in a prominent tube; eye small, not prominent. Mouth narrow; maxillary reaching vertical from middle of pupil. Teeth simple, lanceolate, curved backward, in 8 or 10 oblique rows in the half of each jaw. Gill slit reduced to a small opening above pectoral, not extending down to upper pectoral ray.

Origin of dorsal above gill slit; about 15 of the anterior rays enveloped in a gelatinous tissue beneath the skin. Caudal of eight rays; anal joined to basal half of caudal. Pectoral notched, the lower lobe short, consisting of five rays, the longest reaching nearly to

FIG. 11.—RELATIVE SIZE AND POSITION OF VENT AND DISK OF *CAREPROCTUS ROSEOFUSCUS*.

vent. Disk small, deeply cupped and probably functionless, separated from vent by a distance slightly exceeding its own diameter. (Fig. 11.)

Skin translucent, the anterior parts rosy in life; abdomen and peritoneum black; posterior margin of dorsal and anal and the caudal dusky.

Two cotypes from the type-locality, and two other cotypes from station 5018, off Cape Tonin, east coast of Sagalin, 100 fathoms.

19. CAREPROCTUS COLLETTI Gilbert.

Plate 46, fig. 1.

Careproctus colletti GILBERT, Rept. Comm. Fish and Fisheries for 1893 (1896), p. 442.

Known hitherto only from small specimens (the type 85 mm. long) taken south of the Alaska Peninsula, at a depth of 625 fathoms. Through the present collection, its range is extended to the southern Okhotsk and the northern part of the Sea of Japan, and much larger specimens were obtained, the largest reaching a length of 298 mm. The following description is based on the new material.

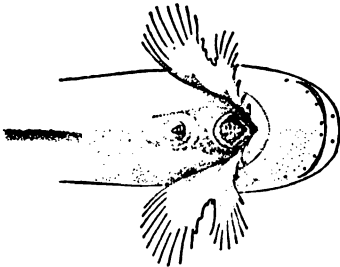


FIG. 12.—RELATIVE SIZE AND POSITION OF VENT AND DISK OF *CAREPROCTUS COLLETTI*.

Measurements in hundredths of length without caudal: Length of head 23; width of head 14.5; interocular width 11; width at angles of mouth 12.3; distance from tip of snout to front of orbit 8.8; diameter of eye 5; distance from tip of snout to end of maxillary 13; length of gill slit 3; depth

of body 28; distance from tip of snout to front of disk 15; to anus 21.5; to front of anal 36; to front of dorsal 28; diameter of disk 4.6; distance from disk to anus 2.3; longest pectoral ray of upper lobe 15; of lower lobe 26; of shortest ray in notch 5.2.

Dorsal 55; anal 49; pectoral 28; caudal 10; pyloric cæca 13.

The species is apparently always smooth, as two adult males and two adult females are alike without any trace of simple or multifid prickles; form compressed, of medium depth, the top of head gently convex transversely, a trifle flattened above front of orbit; cheeks subvertical; snout very deep, bluntly rounded, a little protruding beyond premaxillaries; mouth broadly curved, with short lateral cleft, the tip of maxillary below middle of eye; teeth lanceolate, without cusps, in adults in very numerous oblique series, 20 to 26 in half of each jaw. A distinct short nostril tube, inserted slightly below level of upper rim of orbit. Gill slit short, wholly above pectoral base.

Disk small, distinctly cupped, its center under middle of cheek behind eye, its distance from vent from a half to three fourths its own diameter. (Fig. 12.)

Pectoral rays shortening regularly to the notch, which is not unusually deep, the long exerted lower rays beginning abruptly; longest rays of lower lobe extending well behind the upper part of fin, and beyond the origin of the anal.

Caudal broad, of ten rays, its posterior margin gently concave, evidently approaching the condition in *Prognurus*; caudal joined to anal for two-fifths its length.

Color in life gray, everywhere very finely punctulate with black; head, body, and fins lightly tinged with red, most pronounced on front of head and on pectoral fins. Lower pectoral rays faintly barred. Vertical fins anteriorly with a narrow black margin, which gradually broadens posteriorly until it involves the entire height of the fins. Lips, mouth, and gill cavity dusky, the peritoneum black.

Specimens were taken from the following stations:

	Fathoms
4982. Off northwest coast of Hokkaido.....	390
5029. Southern Okhotsk Sea, off Cape Patience.....	440

20. CAREPROCTUS SINENSIS, new species.

Plate 46, fig. 2.

Type.—Cat. No. 73339, U.S.N.M.—A male, 68 mm. in total length, from station 4813, off Sado Island, Sea of Japan; depth 200 fathoms.

Measurements in hundredths of length exclusive of caudal fin (63 mm.): Length of head 27; interocular width 12; greatest width of head 15; width at angles of mouth 12; distance from tip of snout to front of orbit 11; diameter of eye 5; distance from front of upper jaw to tip of maxillary 12; length of gill slit 4.5; greatest depth (opposite nape) 27; distance from tip of snout to front of disk 19; to anus 27; to front of anal fin 40; to front of dorsal 30; diameter of disk 7.5; longest pectoral ray of upper lobe 22; of lower lobe 11; shortest ray in notch 7.

Dorsal 47; anal 47; pectoral 33.

Body deepest at nape, which is strongly convex and protruding; depth decreasing rapidly at middle of pectoral. Head compressed, deep, sides vertical; occiput swollen, rising abruptly. Snout not split, slightly or not at all projecting beyond premaxillaries; nostril in a short tube, in front of eye; eye small; mouth terminal, maxillary reaching vertical from pupil. Teeth slender, weakly trilobed, in broad bands, the outer teeth smaller in size. Gill slit wholly above the pectoral, its lower end on level of upper pectoral ray.

Five or six anterior dorsal rays shortened, not protruding through the lax skin. Caudal moderate, joined to anal for half its length;

FIG. 13.—RELATIVE SIZE AND POSITION OF VENT AND DISK OF CAREPROCTUS SINENSIS.

dorsal and anal joining caudal without notch. Pectoral notched, the lower lobe consisting of six short thickened rays with free tips, which reach slightly past the vent. Disk well developed, its anterior edge a short distance behind the eye. Vent immediately behind disk. (Fig. 13.)

Color pale, skin transparent, probably pinkish in life.

Only the type known.

21. *CAREPROCTUS PYCNOSOMA*, new species.

Plate 46, fig. 3.

Type.—Cat. No. 73340, U.S.N.M. Forty-six mm. long, from station 4803, off Simushir Island, Japan; depth 229 fathoms.

Measurements in hundredths of length without caudal fin (41 mm.): Length of head 28; greatest width of head 18; interocular width 10; width at angles of mouth 12; distance from tip of snout to front of orbit 9.5; diameter of eye 7.5; diameter of pupil 3; distance from tip of snout to end of maxillary 10; length of gill slit 4.5; greatest depth of body 19; distance from tip of snout to front of disk 15.5; to anus 31; to front of anal fin 41; to front of dorsal 31; diameter of disk 8; distance from disk to anus 7; longest pectoral ray of upper lobe 17; of lower lobe 10; of shortest ray in notch 9.

Dorsal 42; anal 37; pectoral 37.

FIG. 14.—RELATIVE SIZE AND POSITION OF VENT AND DISK OF *CAREPROCTUS PYCNOSOMA*.

Body short, rather slender, compressed; head thick and blunt, nearly as wide as deep; sides of head vertical; occiput not swollen. Snout blunt, broad, not high, and not protruding beyond premaxillaries; nostril tube short but well developed, its posterior margin raised into a flap; its insertion high, on level with upper rim of orbit. Mouth broad, maxillary reaching vertical from slightly behind anterior margin of eye. Teeth strongly trilobed, in broad bands. Gill opening short, wholly above pectoral.

Anterior dorsal rays not shortened, their tips free, not hidden beneath the skin. Caudal broad, truncate, of about 10 rays, joined to anal for one-third its length; no dorsal or anal notch. Pectoral very little notched, the lower lobe of 7 rays and very short. Disk moderate, not deeply cupped, the anterior edge under posterior margin of pupil. Vent separated from disk by two-thirds diameter of disk. (Fig. 14.)

Color dusky, lighter about head and snout.

Apparently related to *C. ectenes*, but distinguished by shape of snout and length of body and the number of fin rays.

Only the type taken.

22. CAREPROCTUS CURILANUS, new species.

Plate 47, fig. 1.

Type.—Cat. No. 73341, U.S.N.M. A male, 72 mm. long, from station 4803, off Simushir Island, Japan; depth 229 fathoms.

Measurements in hundredths of length without caudal (66 mm.): Length of head 22.5; greatest width of head 16; interorbital width 4.2; width at upper margin of pupils 10; width at angles of mouth 11.5; distance from tip of snout to front of orbit 8; diameter of eye 8; distance from tip of snout to end of maxillary 8.5; length of gill slit 4; greatest depth of body 16; distance from tip of snout to front of disk 13; to anus 21.5; to front of anal fin 34; to front of dorsal 24; diameter of disk 8; distance disk to anus 2; longest pectoral ray of upper lobe 15; of lower lobe 15; shortest ray in notch 5.

Dorsal 49; anal 43; pectoral 34; caudal 10.

Body as in *C. ectenes*, depressed anteriorly, elongate. Head depressed, its width greater than its depth; occiput flattened; cheeks slightly swollen; snout depressed, projecting slightly beyond the mouth; nostril in a well developed tube, on level of upper line of pupil; eye large, the pupil large and round; mouth small, transverse; maxillary reaching vertical from anterior margin of pupil. Teeth in broad bands, rather slender, with well developed lateral lobes. Gill slit extending down in front of one or two pectoral rays.

FIG. 15.—RELATIVE SIZE AND POSITION OF VENT AND DISK OF CAREPROCTUS CURILANUS.

Anterior dorsal rays slightly or not at all shortened, the tips projecting freely. Caudal short, truncate; its connection to the anal equal to about two-fifths its length; no dorsal or anal notch. Pectoral notched, the lower lobe composed of nine rays and reaching slightly past vent. Disk moderate, not deeply cupped, with a very small center and a broad flap; vent close behind disk. (Fig. 15.)

Skin transparent; the body pale, dusted with dark brown dots; mouth and gill cavity pale; peritoneum with very fine black dots. In life, deep red, with slight brownish tinge, especially on head; belly purplish or blue.

Related to *C. ectenes*; distinguished by the greater number of rays in the pectoral, the lighter coloration, a larger disk, and the gill opening extending down in front of the pectoral.

A single cotype was taken at the same station as the type.

23. CAREPROCTUS HOMOPTERUS, new species.

Plate 47, fig. 2.

Type.—Cat. No. 73342, U.S.N.M. Forty-eight mm. long, from station 5029, southeast of Cape Patience, Sagalin, depth 440 fathoms.

Measurements in hundredths of length without caudal (43 mm.): Length of head 24; greatest width of head 14; interocular width 10; width at angles of mouth 9; distance from tip of snout to front of eye 8; diameter of eye 6.3; depth of body 18; length of gill slit 3.2; distance from tip of snout to front of disk 14; to anus 26.5; diameter of disk 8; longest pectoral ray of upper lobe 18; of lower lobe 6.

Dorsal 55; anal 49; pectoral 34; caudal 10.

Body slightly deeper and more compressed than in its nearest congener, *C. attenuatus* from Bering Sea, the snout not so deep and less blunt, its upper profile rising more gradually from the mouth. Teeth simple, or some of them with weak lateral lobes. Gill slit

extending down in advance of upper pectoral ray. Nostril placed high, in advance of upper margin of eye, in a broad short tube.

Anterior dorsal rays increasing regularly in length, the anterior ray short, about half diameter of eye. Pectoral very indistinctly notched, the rays decreasing regularly downwards, a few

FIG. 16.—RELATIVE SIZE AND POSITION OF VENT AND DISK OF CAREPROCTUS HOMOPTERUS.

of the lower with weakly exerted tips, and two or three of them a trifle lengthened, the longest not reaching posterior border of disk.

Color pale to dusky about the head, nearly uniformly dusky on body; peritoneum pale, the stomach appearing black through the abdominal wall.

In general appearance this species closely resembles *C. attenuatus*, which differs in its blunter deeper snout, larger eye, smaller disk, longer first dorsal ray, and especially in its well developed lower pectoral lobe, in which the rays are lengthened and strongly exerted, extending beyond the vent.

Only the type known.

24. CAREPROCTUS ENTOMELAS, new species.

Plate 47, fig. 3.

Type.—Cat. No. 73343, U.S.N.M., 77 mm. in total length, from station 4983, Shiruunku Bay, west coast Hokkaido, depth 428 fathoms.

Measurements in hundredths of length without caudal (70 mm.): Length of head 25; greatest width of head 15.5; interocular width 12; width at angles of mouth 10.5; distance from tip of snout to

front of orbit 11; diameter of eye 6.5; diameter of pupil 3; distance from tip of snout to end of maxillary 12.5; length of gill slit 3; greatest depth of body 19; distance from tip of snout to front of disk 15; to anus 26.5; to front of anal fin 36; to front of dorsal 27; diameter of disk 7; distance from disk to anus 4; longest pectoral ray of upper lobe 14.5; of lower lobe 15; shortest ray in notch 4.

Dorsal 53; anal 46; pectoral 28; caudal 8; pyloric cæca 19.

Body elongate, moderately compressed. Head deeper than wide, the sides vertical, the occiput flattened and gently convex, not swollen. Pupil large, nearly half diameter of eye. Snout short, deep, bluntly rounded, slightly protruding beyond the premaxillaries; jaws nearly equal; nostril in front of middle of eye or slightly higher, with the rim a little raised. Teeth lanceolate, recurved, in broad bands, about 13 oblique rows in the half of each jaw. Gill slit very narrow, entirely above base of pectoral.

Anterior dorsal rays increasing gradually in length; caudal truncate, slender, its connection with the anal equal to one-third its length; last dorsal and anal rays not shortened; pectoral notched, the tip of upper lobe reaching a point midway between vent and anal origin.

FIG. 17.—RELATIVE SIZE AND POSITION OF VENT AND DISK OF *CAREPROCTUS ENTOMELAS*.

Disk moderate, oval, very deeply cupped, the anterior margin crenulate but not lobed, a notch on each side separating it from posterior margin. Vent near disk, separated from it by slightly more than half length of disk. (Fig. 17.)

Color pale, translucent, everywhere dusted with minute black points, these less numerous and coarser on the abdomen; lips blackish; abdomen silvery, the peritoneum jet black.

Coarse "thumb tack" prickles scattered over top of head and on body.

Closely related to *C. colletti*, differing in the deeper body, the longer more protruding snout, the lighter color, and the presence of prickles.

A badly mutilated specimen from station 4838, west of Tsuruga, Sea of Japan, depth 144 fathoms, seems to belong to this species, but its condition does not admit of positive identification.

25. *CAREPROCTUS ENTARGYREUS*, new species.

Plate 47, fig. 4.

Type.—Cat. No. 73344, U.S.N.M., 61 mm. long, from station 4998, Gulf of Tartary, depth 66 fathoms.

Measurements in hundredths of length without caudal fin (57 mm.): Length of head 25; greatest width of head 17; interocular width 13.5; width at angles of orbit 9; diameter of eye 6.5; diameter of pupil 1; distance from tip of snout to end of maxillary 12.5; length

of gill slit 3.5; greatest depth of body 19; distance from tip of snout to front of disk 15.5; to anus 27; to front of anal fin 36; to front of dorsal 28; diameter of disk 9; distance from disk to anus 3; longest pectoral ray of upper lobe 13; of lower lobe 15; shortest ray in notch 6.

Dorsal 54; anal 47; pectoral 31.

Body elongate, with heavy head, vertical cheeks and short bluntly rounded snout which protrudes slightly beyond mouth; nostril in front of eye, slightly above its middle, the rim a little raised; gill slit short, entirely above upper pectoral ray; disk moderate, deeply cupped, its anterior margin prominent, with the appearance of a projecting lobe; vent close behind disk, separated from it by about one-third diameter of disk. (Fig. 18.) Pectorals broad, rather shallowly notched, the lower lobe short, extending little behind the vent.

FIG. 18.—RELATIVE SIZE AND POSITION OF VENT AND DISK OF *CAREPROCTUS ENTAMELUS*.

Small prickles scattered over head and body.

Color light, without red in life, the lining of mouth and gill cavity not dusky; peritoneum silvery, with scattered black dots, instead of jet black as in *C. entomelas*.

Agreeing in most respects with *C. entomelas*, but with less black pigment, and with the pupil reduced to a minute pore, while in *C. entomelas* it is of the usual size, nearly half the diameter of the eye.

A single cotype, from the Gulf of Tartary (station 5003, 35 fathoms) agrees with the type in all respects.

26. *CRYSTALLIAS MATSUSHIMÆ* Jordan and Snyder.

Crystallias matsushimæ JORDAN and SNYDER, Proc. U. S. Nat. Mus., vol. 24, 1902, p. 350, fig. 2 (Matsushima Bay, Japan).

This species, known hitherto from a single specimen from the Bay of Matsushima, is represented in the present collection by eight individuals from the Sea of Japan and the Southern Okhotsk. Owing to the poor condition of the type-specimen, the original description was incomplete and the following details are here supplied:

Measurements in hundredths of length without caudal (197 mm.): Length of head 30; diameter of eye 5.5; length of snout 13; interocular width 13; projection of snout beyond the mouth 8; length of gill slit 5; distance from tip of mandible to front of disk 8; to anus 17; diameter of disk 7.5; depth of body 35; longest pectoral ray of upper lobe 21; of lower lobe 11; length of caudal 13; length of attachment between caudal and anal 9.

Dorsal 57; anal 50; pectoral 33; caudal 13, 6 in upper half, 7 in the lower; pyloric cæca 54.

Form deeper than indicated in the figure of the type,¹ the snout projecting much farther beyond the mouth and the barbels much larger and more conspicuous. The barbels are 16 in number, constant in position, attached to the inferior side of the snout, the upper lip and the chin. On the snout is an anterior row of two, each with a small papilla-like projection at its outer base, and a posterior row of six, following the curve of the mouth, the middle pair closely apposed. The upper lip is produced into a deep flap, the margin of which bears three barbels. The chin bears a median barbel and two on each side, the inner pair accompanied posteriorly by a papilla-like projection. The snout and mandible contain the usual pores, which alternate with the barbels.

The pectoral fin is only shallowly notched, the lower rays becoming more and more exserted, and a few of them slightly elongated to form a lobe. The caudal fin is widely joined to dorsal and anal, the last dorsal rays slightly shortened, forming a notch, the anal joining without notch. Ventral disk of moderate size, its anterior margin immediately under the vertical from back of eye, the vent close behind it.

Color in life, translucent, with a slight reddish tint, the half-bars and spots a deeper reddish brown, darker on the margins of the bars.

Specimens were taken from the following stations:

	Fathoms.
4812. Near Sado Islands, Sea of Japan.....	176
4813. Near Sado Islands, Sea of Japan.....	200
4855. Off Korea, Sea of Japan.....	70
4867. Off Korea, Sea of Japan.....	150
4994. Off northwest end Hokkaido.....	190
5021. Off Cape Patience, Sagalin.....	73
5025. Off Cape Patience, Sagalin.....	52

27. *PARALIPARIS ATRAMENTATUS*, new species.

Plate 48, fig. 1.

Type.—Cat. No. 73345, U.S.N.M. A male, 76 mm. long, from station 4971, off the east coast of Hondo; depth 649 fathoms.

Measurements in hundredths of length without caudal (69 mm.): Length of head 22; of snout 6; of maxillary 9; diameter of eye 6; interocular width 8.2; distance from tip of snout to anus 18; to front of anal fin 34; to front of dorsal 19.5; greatest depth of body 15.

Dorsal 52; anal 44; caudal 8; pectoral 20.

Body slender, elongate. Head depressed, the crown flat, slightly raised. Snout short and deep, rising abruptly, slightly projecting beyond the mouth; lower jaw included. Nostril in a short narrow tube, in front of eye on level of upper margin of pupil. Mouth horizontal, beneath the snout; maxillary reaching vertical from posterior margin of eye. Teeth stout and blunt, not pointed, arranged in narrow bands, about eight oblique rows laterally in each jaw. Gill opening apparently wholly above pectoral.

First dorsal rays short, increasing gradually in length. Caudal consisting of eight slender rays, its basal third apparently joined to anal. Pectoral consisting of two elongate lobes connected by short widely spaced rays; the upper lobe reaching slightly past origin of anal; lower lobe mutilated in the type, its shape not to be determined. Vent under upper base of pectoral.

Coloration apparently black or dusty, the integument largely lost; snout dusky; abdomen and peritoneum black.

Not closely related to any known species, differing widely from all others in the character of the teeth.

Only the type taken.

28. *PARALIPARIS MELANOBRANCHUS*, new species.

Plate 48, fig. 2.

Type.—Cat. No. 73346, U.S.N.M. A male, 83 mm. long, from station 5029, in the southern part of the Chhotsk Sea; depth 440 fathoms.

Measurements in hundredths of length without caudal (76 mm.): Length of head 22; of snout 6; of maxillary 9.5; diameter of eye 6; length of gill slit 3; interocular width 8; distance from tip of snout to anus 16; to front of anal 30; to front of dorsal 25; greatest depth 21; length of base of pectoral 13; longest pectoral ray of upper lobe 13; of lower lobe 11; shortest ray in notch 7.5.

Dorsal 60; anal 53; pectoral 17; caudal 4.

Body moderately deep and compressed, the upper profile rising in a strong convex curve to occiput, thence declining rapidly in a straight line to nostrils; snout bluntly rounded; interorbital flat and broad; eye large; jaws even; nostril in front of middle of eye, with a slightly raised rim. Mouth broad, angle under pupil; maxillary reaching vertical from posterior margin of eye. Teeth rather stout, in broad bands, the inner teeth not enlarged or canineline, in about 12 oblique rows. Gill slit small, wholly above pectoral.

Anterior dorsal rays short and increasing very gradually in length. Caudal slender, truncate, of four slender rays, joined to anal for about one-third its length. Pectoral notched, upper rays on level of pupil, close set, the intervals between the rays increasing downward, those in the notch very distant, but the membrane extending from tip to tip, not cleft to base of fin; upper lobe reaching a little past front of anal. Vent close behind base of pectorals.

Skin transparent, with a few scattered dots; body dusted with dark brown dots; chin dusky; abdomen, gill cavity, and mouth black.

Only the type taken.

29. *PARALIPARIS ENTOCHLORIS*, new species.

Plate 48, fig. 3.

Type.—Cat. No. 73347, U.S.N.M. A male, 98 mm. in total length, from station 5018 in the southern part of the Okhotsk Sea; depth 100 fathoms.

Measurements in hundredths of length without caudal (87 mm.): Length of head 22.5; of snout 6; of maxillary 10; diameter of eye 6.5; length of gill slit 3; interocular width 8; distance from tip of snout to anus 17.5; to front of anal 30; to front of dorsal 24; greatest depth 20; length of base of pectoral 13; longest pectoral ray of upper lobe 19; of lower lobe 14; shortest ray in notch 7.

Dorsal 63; anal 56; pectoral 20; caudal 6.

Body rather deep, compressed; occiput only slightly gibbous; snout deep, blunt, not projecting; jaws equal; eye large. Mouth horizontal; maxillary reaching vertical from posterior margin of pupil. Teeth slender, pointed, in well-developed bands, the inner teeth enlarged, caninelike, larger in the upper than in the lower jaw. Nostril in front of eye, on level of upper edge of pupil, the tube little more than a raised rim. Gill slit short, wholly above the base of the pectoral.

Anterior dorsal rays increasing very rapidly in length, the first six or seven graduated; dorsal and anal rays very slender. Caudal composed of six slender elongate rays, its union with anal equal to nearly half its length. Pectoral consisting of two lobes, the lower rays of upper lobe more widely spaced; base of upper pectoral ray on a level with upper edge of pupil; tip of upper pectoral lobe reaching fifth anal ray; lower lobe consisting of five elongate half free rays, reaching almost to anal. Vent well behind base of lower pectoral rays, separated from them by about one-half their distance from tip of mandible.

Head and body entirely denuded of skin; body with scattered black dots, these thickest on occiput; gill cavity black; mouth pale; peritoneum heavily spotted with black. In life, nearly translucent, with a faint tinge of red; peritoneum green, visible through the body walls.

Related to *P. melanobranchus*, differing in the number of pectoral and caudal rays, in the length of the lower lobe of the pectoral, the position of the vent, and in the characters of the teeth and the anterior dorsal rays.

A single cotype was taken with the type.

30. RHINOLIPARIS BARBULIFER Gilbert.

Rhinoliparis barbulifer GILBERT, Rep. Comm. Fish and Fisheries for 1893 (1896), p. 445 (Bering Sea).

Taken abundantly in the southern part of the Okhotsk Sea off the coast of Sagalin, off the south coast of Hokkaido, and near Matsushima Bay, east coast of Hondo; but the species was not taken in the Sea of Japan. It has been known hitherto from Bering Sea north of Unalaska Island, and in its distribution seems to accompany the cold current which sweeps down the coast of northern Japan and can be detected somewhat to the southward of Matsushima Bay.

There is no evidence that this or any closely allied species is pelagic. It has been captured only in the bottom trawl, and its range in depth is such as bottom forms usually exhibit. In Bering Sea it was taken at depths of 225-576 fathoms; in the Japanese waters the depth was found to range from 192 to 359 fathoms.

Specimens were taken from the following stations:

	Fathoms.
5019. Off east coast of Sagalin.....	192
5028. Off east coast of Sagalin.....	241
5039. Off southeast coast Hokkaido.....	269-326
5043. Off southeast coast Hokkaido.....	309-330
5044. Off southeast coast Hokkaido.....	309-359
5045. Off southeast coast Hokkaido.....	359
5050. Off Matsushima Bay.....	266

31. *NECTOLIPARIS PELAGICUS* Gilbert and Burke.

Nectoliparis pelagicus GILBERT and BURKE, Bull. Bur. Fish., vol. 30, 1910 (1912), p. 82, fig. 27.

This peculiar pelagic form, which has usually been captured at intermediate depths of 300 fathoms, is not rare throughout Bering Sea and the northern Okhotsk. The present collection contains one specimen from the extreme southern part of the Okhotsk Sea and another from the southern coast of Hokkaido. The species probably entered the dredge at intermediate depths.

Specimens were taken from the following stations:

	Fathoms.
5032. Yezo Suido, southern Okhotsk.....	300-533
5039. Off southeast coast Hokkaido.....	269-326

1. *CYCLOGASTER CURILENSIS*. (PAGE 353.) FROM THE TYPE.

2. *CYCLOGASTER SIMUSHIRÆ*. (PAGE 354.) FROM THE TYPE.

3. *CYCLOGASTER TESSELLATUS*. (PAGE 355.) FROM THE TYPE.

1. *CYCLOGASTER FRENATUS*. (PAGE 356.) FROM THE TYPE.

2. *CYCLOGASTER TANAKÆ*. (PAGE 357.) FROM THE TYPE.

3. *CYCLOGASTER OCHOTENSIS*. (PAGE 359.)

1. *CYCLOGASTER INGENS*. (PAGE 360.) FROM THE TYPE.

2. *CAREPROCTUS RASTRINUS*. (PAGE 362.) FROM THE TYPE.

3. *CAREPROCTUS ACANTHODES*. (PAGE 363.) FROM THE TYPE.

1. CAREPROCTUS TRACHYSOMA. (PAGE 364.) FROM THE TYPE.

2. CAREPROCTUS RHODOMELAS. (PAGE 365.) FROM THE TYPE.

3. CAREPROCTUS PELLUCIDUS. (PAGE 366.) FROM THE TYPE.

1. CAREPROCTUS SEGALIENSIS. (PAGE 367.) FROM THE TYPE.

2. CAREPROCTUS BATHYCÆTUS. (PAGE 368.) FROM THE TYPE.

3. CAREPROCTUS ROSEOFUSCUS. (PAGE 369.) FROM THE TYPE.

1. CAREPROCTUS COLLETTI. (PAGE 370.)

2. CAREPROCTUS SINENSIS. (PAGE 371.) FROM THE TYPE.

3. CAREPROCTUS PYCNOSOMA. (PAGE 372.) FROM THE TYPE.

1. CAREPROCTUS CURILANUS. (PAGE 373.) FROM THE TYPE.

2. CAREPROCTUS HOMOPTERUS. (PAGE 374.) FROM THE TYPE.

3. CAREPROCTUS ENTOMELAS. (PAGE 374.) FROM THE TYPE.

4. CAREPROCTUS ENTARGYREUS. (PAGE 375.)

1. PARALIPARIS ATRAMENTATUS. (PAGE 377.)

2. PARALIPARIS MELANOBRANCHUS. (PAGE 378.) FROM THE TYPE.

3. PARALIPARIS ENTOCHLORIS. (PAGE 378.) FROM THE TYPE.

SOME NEW MOLLUSCA FROM THE SILURIAN FORMATIONS OF WASHINGTON COUNTY, MAINE.

By HENRY SHALER WILLIAMS,
Of Cornell University, Ithaca, New York.

INTRODUCTION.

In the course of preparing the monograph on the Chapman Fauna of Aroostook County, Maine, I published two short papers in these proceedings which properly belong to this series of papers on the Paleozoic fossils of Maine, as follows:

No. 1. A new Brachiopod, *Rensselaeria mainensis*, from the Devonian of Maine.¹

No. 2. On the revision of the Mollusk genus *Pterinea* Goldfuss.²
The present paper constitutes the third issue of this series.

In the second paper the new genera *Tolmaia*, *Follmannella*, *Actinopterella*, and *Cornellites* were described.

The type-species of the genus *Tolmaia* is *Pterinea lineata* Goldfuss, and the species *Pterinea* (*Pteronitella*?) *incurvata* Clarke,³ described from the Lower Devonian of Dalhousie, New Brunswick, is referred to as probably belonging to this genus. The type of the genus *Follmannella* is *Pterinea mainensis* Clarke, from the Eodevonian of Moosehead Lake region in Somerset County, Maine.⁴

The type of the genus *Actinopterella* is *Pterinea radialis* Clarke, part, from the Chapman sandstone on Presque Isle stream, Chapman Plantation, Aroostook County, Maine.⁵

The types of the last two genera from the same localities had already been described and named in manuscript by the writer when Clarke's paper was published, and other species of these genera are described in the monograph on the Chapman fauna now (January, 1912) in course of publication by the United States Geological Survey.

¹ Proc. U. S. Nat. Mus., No. 1527, vol. 32, pages 267-269, published April 18, 1907.

² Idem, No. 1600, vol. 34, pages 83-90, published April 17, 1908.

³ N. Y. State Mus., Bull. 107, 1907, p. 210.

⁴ Idem, p. 201.

⁵ Idem, p. 207.

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THE NEW MOLLUSCA FROM THE LOWER DEVONIAN OF WASHINGTON COUNTY, MAINE

By HENRY SEYMOUR VAILLE
Of Cornell University, Ithaca, New York

1. *E. shaleri*,

umbonal angle

In the course of preparing the monograph of the Lower Devonian
of Aroostook County, Maine, I published two papers in the
proceedings which properly belong to the series of papers on the
Devonian fossils of Maine, as follows:

No. 1. A new Brachiopod, *Brachiodonta* *shaleri*, from the
of Maine.

No. 2. On the revision of the Maine Devonian
The present paper constitutes the third paper in the series.
In the second paper the new genera *Pterinea*, *Pteronella*,
Pterella, and *Cornulites* were described.

The type-species of the genus *Pterinea* is *Pterinea*
the species *Pterinea* *shaleri*, from the
in the Lower Devonian of Washington County, Maine,
probably belonging to this genus. The type-species
Pterinea is *Pterinea* *shaleri*.

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The following species are published to illustrate the paleontology of the Eastport quadrangle of Washington County in the southeast corner of Maine, the field work on which has already been completed by a party of the United States Geological Survey in charge of Edson S. Bastin, who has in course of preparation the folio maps of the Eastport quadrangle.

EURYMYELLA, new genus.

Shell thin, subtriangular in outline, compressed, high and subulate posteriorly, narrowed anteriorly, the front curving regularly from the cardinal angle into the base. Beaks small and low. Umbonal ridge moderately elevated, rounded or subangular. No mesial sulcus. The surface forward and downward from the umbonal ridge is slightly convex or flattened, not concave. Hinge line straight, narrow, slightly thickened at edge, generally without distinct teeth. A small obscure thickening of the hinge is seen in an occasional specimen under the beak of the right valve, with a broader thickening in the same position in the left valve, and in a single specimen a linear thickening of the inner edge of the hinge margin is evident near its posterior end. Ligament linear, external.

Anterior adductor impression distinct, situated close under the hinge, subovate, sharply defined on the inner side by a strong, short ridge coming down from the hinge border. Posterior muscular scar too indistinct for description. Pallial line simple. Umbonal and pedal muscular pits present on the sides of the umbonal cavity and behind the anterior muscular scar in some specimens.

Type-species.—*Eurymyella shaleri*, new species.

REMARKS ON THE GENUS EURYMYELLA.

The genus *Eurymyella* is erected for a group of fossil Pelecypoda found abundantly in the shales of Moose Island, Eastport, Maine. The fossils were noted by N. S. Shaler in a paper on the Geology of the Cobscook Bay District, Me.,¹ as "*Modiomorpha*, allied to *M. subulata*," and the particular localities named by Shaler are "Shackford Head," a promontory on the west side, and "Princess Cove," on the south end of Moose Island. The rocks containing them constitute the upper formation of the Silurian series called by Shaler the "Cobscook Bay series." They are immediately overlain, unconformably, by the Perry formation, the flora of which is fully described by David White and assigned to the Devonian age.²

By "*Modiomorpha subulata*" is probably intended *Cypricardites subulata* Conrad,³ described by Conrad as from the "shales near

¹ Amer. Journ. Sci., ser. 3, vol. 23, 1886, p. 58.

² Smith and White, Geology of the Perry Basin in Southeastern Maine. U. S. Geol. Surv., Prof. Paper No. 35, 1905.

³ 5th Ann. Rept. Geol. Surv., New York, 1841, p. 53.

Apulia [=Hamilton formation], Onondaga County, N. Y., tab. No. 22, Ithaca," but not figured. The specific name was spelled *subulata* in the list¹ given by Conrad. The same spelling is used in referring to it in the list of species of the Hamilton in Vanuxem's final report.² In the final report on the Paleontology of New York State³ Hall figured this species under the name *Modiomorpha subalata*, referring it to the genus *Modiomorpha* which he had described and named in 1870.⁴

In reporting this Eastport fauna in 1905 Williams⁵ recognized Shaler's reference of this species to the genus *Modiomorpha* and tentatively to the species of *subulata* Conrad, and it was upon this identification that the Devonian age of the formation was inferred. In the same paper Schuchert listed species from Carlow Island and north end of Moose Island under the names "*Whiteavesia* sp. new," "*Modiolopsis* sp. undetermined," and "*Psiloconchoid pelecypod*." In the first case it was associated with "*Leperditia* of the *L. alta* type," thus bringing in a new means of correlation. Schuchert rightly determined the age as "unmistakably Siluric and beneath the Helderbergian."⁶

Later investigations have fully confirmed the correctness of Schuchert's conclusion that the Carlow Island and Moose Island faunas are alike, and the same species of *Eurymyella* occur in both.

Critical examination of a large number of specimens brought together in the recent survey of the Eastport quadrangle has made it clear to the writer that these Eastport modiolopoid forms differ from both *Modiomorpha* Hall⁷ and *Modiolopsis* Hall⁸ in the absence of a median sulcus in front of the umbonal ridge. In this particular they agree with McCoy's genus *Anodontopsis*⁹ and Ulrich's genera *Whiteavesia*¹⁰ and *Eurymya*.¹¹ The mistake in generic reference of the species made by Shaler and Williams (as probably also by others) was due to the fact that the larger specimens are often grooved in the place of the natural median sulcus of *Modiomorpha* and *Modiolopsis*, due (as has been learned by careful inspection) to the crushing of the very fragile shells. Such specimens show the shell to have been cracked along this line, but when uncrushed the shell is found to have the ventral margin convexly curved throughout and has no byssal

¹ 5th Ann. Rept. Geol. Surv., New York, 1841, p. 36.

² N. Y. Geol., 3d District, 1842, p. 162.

³ Nat. Hist. N. Y., vol. 5, pt. 1, Lamellibranchiata, II, 1885, p. 263, pls. 35 and 39.

⁴ Prel. notice, Lam., Shells, pt. 2, 1870, p. 72.

⁵ U. S. Geol. Surv., Prof. Paper 35, p. 24.

⁶ Idem., p. 26.

⁷ Hall, J., Prel. notice, Lam., Shells, pt. 2, 1870, p. 72.

⁸ Hall, Nat. Hist. N. Y., Pal., vol. 1, 1847, p. 157.

⁹ McCoy, F., Ann. and Mag. Nat. Hist., ser. 2, vol. 7, 1851, p. 54.

¹⁰ Ulrich, E. O., Geol. and Nat. Hist. Surv. Minnesota, Final Report, 1894, p. 513. (Note: in the text the name used is *Actinomya*, but on page 628 the name *Whiteavesia* is substituted for *Actinomya*, which was found to be preoccupied.)

¹¹ Ulrich, Idem, p. 512.

furrow or median sulcus in perfectly preserved specimens. The species *Modiolopsis cincinnatiensis* Hall and Whitefield is taken by Ulrich as genotype of his genus *Whiteavesia*, although we find contained in the original definition of that species the characters upon the absence of which the new genus was based. The specific definition includes the following clauses: "Basal line gently curving throughout its length in most cases, but in some examples becoming slightly sinuate opposite or a little posterior to the beaks," and "an obscure, shallow mesial depression extends across the valves from the beaks, reaching the basal line just behind the anterior third of the length."¹ This is inconsistent with that part of the generic definition of *Whiteavesia* which reads, "Base gently convex, occasionally straight, never sinuate. Mesial sulcus wanting."²

Our genus *Eurymyella* agrees with the generic definition of Ulrich's *Whiteavesia* in the gently convex or straight base and absence of mesial sulcus, but differs from it in lacking the "radii or divaricating folds" which are described in the definition and reproduced upon the illustration given of the genotype *Modiolopsis cincinnatiensis*³ and more distinctly expressed by *M. cancellata* Walcott,⁴ which is the second species cited as representing the genus *Whiteavesia*. *Eurymyella* also differs from *Whiteavesia* in its hinge. Whereas in *Eurymyella* the hinge plate is typically very narrow at the sides and without lateral teeth, it is fairly strong under the beaks and has a cardinal tooth or teeth expressed there in both valves. It also differs by its small low beaks. The beak is described as "comparatively large, full, and rather prominent" in *Whiteavesia*.⁵

Eurymyella very closely resembles Ulrich's genus *Eurymya*, which fact has suggested the name here proposed. The chief difference discovered is in the hinge. The hinge of *Eurymya* is described as "strong with a broad longitudinally striated ligamental area posterior to the beaks and beneath them an obscure cardinal fold or tooth in the left valve and a corresponding depression in the right." The "presence of a striated ligamental area" is specifically named as one of the four principal distinguishing features, separating *Eurymya* from *Modiolopsis*. The genus *Eurymyella* has the obscure cardinal teeth under the beaks, but the lateral parts of the hinge area are, in the typical forms, scarcely more than a linear thickening of the shell margin, and thus lack one of the essential characters of Ulrich's genus *Eurymya*.

The type-species of *Eurymyella* (*E. shaleri*) agrees still more closely with *Anodontopsis angustifrons* McCoy in its external appearance;

¹ Pal. Ohio, vol. 2, pt. 2, 1875, p. 88.

² Ulrich, Geol. and Nat. Hist. Surv. Minnesota, Final Rept., 1894, p. 514.

³ Ulrich, *idem*, p. 514, fig. 39a.

⁴ Trans. Albany Inst., vol. 10, 1879, p. 22, pl. 1, figs. 8 and 8a.

⁵ Ulrich, Geol. and Nat. Hist. Surv. Minnesota, Final Rept., 1894, p. 514.

in fact the figure 15¹ of that species is a fairly good figure of some of the large specimens collected from Eastport. Here again, however, it is the hinge, as described for the genus *Anodontopsis*, which excludes our species from the McCoy genus. McCoy describes the hinge as follows: "Hinge line shorter than the shell, with a posterior, long, slender tooth or cartilage plate extending just below it (double in the right valve), and another similar but shorter one in front of the beaks * * * (occasionally one small cardinal tooth beneath the beak)."²

In no specimen of the type-species of *Eurymyella* have lateral cardinal teeth been discovered. In one species and specimen (*Eurymyella convexa*) there is seen a single short, rather oblique linear groove which may be the mold of a lateral tooth near the extreme posterior end of the hinge area.

At the close of the definition of the species *A. angustifrons* McCoy, we note the statement: "The posterior lateral tooth or plate extends almost to the end of the hinge line and close to it."³ It is not unreasonable to imagine that the obscurity of the hinge characters in these forms is the result of degeneration coincident with a brackish-water environment forced upon a race, the normal representatives of which were marine and possessed more definite development of lateral teeth. In fact this interpretation is suggested by finding in the lower beds on Denbow Point, associated with brachiopods of strictly marine habitat, a species which expresses the generic characters of *Eurymyella* with the added characters of thickening of the shell and widening of the hinge area. (See *Eurymyella denbowensis*, p. 390.) But as a matter of strict definition of characters the typical forms are, by the feeble development of the hinge characters, excluded from the genera *Anodontopsis*, *Eurymya*, and *Whiteavesia*, which they closely resemble in exterior character, and it becomes necessary to erect a new genus to include them.

Both the history of the faunas leading up to the formation in which the *Eurymyella* appear and the associated species (*Lingulas*, ostracods and a few small gastropods) and the fact that the formation is terminated by unconformity, suggest that the environmental conditions were in shallow water near the ocean, but, probably, brackish and not pure salt water.

EURMYELLA SHALERI, new species.

Plate 49, figs. 1, 2, 3, 4.

Shell rather small, thin, fragile, compressed, subtriangular in outline; hinge line straight, long, forming with the umbonal ridge a triangular flattened area or wing. Posterior and anterior extremi-

¹ Brit. Pal. Fossils, 1855, p. 271, pl. 1k, fig. 15.

² Ann. and Mag. Nat. Hist., ser. 2, vol. 7, 1851, p. 54.

³ Idem, p. 55.

ties of hinge rounded, angle between umbonal ridge and hinge margin about 50° . Anterior slope convex, no indication of mesial sulcus. Surface nearly smooth, a few obscure concentric wrinkles of growth are seen over the outer half of the shell and well-preserved shells show faint, irregular, fine, concentric lines.

Size variable, but rarely over 1 inch in length; the large majority of specimens are from one-half to three-fourths of an inch long.

Interior molds occasionally show a distinct anterior muscular scar, but in no specimen has the outline of the posterior scar been traced. The anterior scar is strongly impressed, situated at the extreme antero-cardinal angle below the hinge, and is bounded by a short, strong ridge on the inside. Pedicel scars are frequently seen on the area between the posterior edge of the anterior muscular scar and the bottom of the cavity of the beak. On the anterior side of the umbonal cavity three small, oval pits are seen near the apex and occasionally a fourth half way down toward the anterior adductor.

The cardinal margin in most specimens exhibits little else than a slight thickening of the edge of the very fragile shell. In a few specimens trace of a small oblique thickening of the hinge is seen under the beak of left valves and on right valves a somewhat broader thickening, which perhaps represents two teeth between which the right tooth fits. In most cases the lateral hinge margins are too narrow for the exhibition of any distinct lateral teeth, and the valves are separate in fossilization, although there are many cases of attached valves.

Dimensions of the type-specimens.—(1) Length 22 mm., height 15 mm.; (2) length 19 mm., height 14 mm.; (3) length 23 mm., height 15 mm.; (4) length 19 mm., height 14 mm.

Locality.—The typical locality is in the shales on Moose Island at Shackford Head and on the shores of Broad Cove, where the species is found in great abundance with rarely any other fossil species except *Lingulas* and ostracods.

Cotypes.—Cat. Nos. 58431 to 58433, U.S.N.M.

EURYMYELLA SHALERI, var. **BREVA**, new variety.

Plate 49, figs. 5, 6, and 7.

Form and general characters as in *E. shaleri*, but the height is nearly as great as the length, with correspondingly more erect umbonal ridge.

The proportions of three typical specimens are: (1) Length 15 mm., height 14 mm.; (2) length 16 mm., height 15 mm.; (3) length 16 mm., height 14 mm.; and the umbonal angle is 55° to 65° .

Locality.—Same as the typical forms of the species.

Cotypes.—Cat. No. 58434, U.S.N.M.

EURYMYELLA SHALERI, var. LONGA, new variety.

Plate 49, fig. 8.

General characters as in *E. shaleri*, but the length nearly twice as great as the height and the umbonal angle as low as 35° or less. The type-specimen measures: Length 20 mm., height 12 mm., umbonal angle = 35° .

Locality.—Same as the typical forms of the species.

Holotype.—Cat. No. 58435, U.S.N.M.

EURYMYELLA SHALERI, var. MINOR, new variety.

Plate 49, fig. 9.

General characters of both form and proportions as in *E. shaleri*, but averaging about half the size of typical *E. shaleri*.

Type-specimen.—Length 13 mm., height $8\frac{1}{2}$ mm., umbonal angle about 50° .

Locality.—Carlow Island.

Holotype.—Cat. No. 58436, U.S.N.M.

EURYMYELLA ANGULARIS, new species.

Plate 49, figs. 10, 11.

Shell irregularly pentagonal in form; height four-fifths the length; beak low, scarcely protruding beyond the hinge margin. Hinge line long, straight, from the extremities of which the sides, both anterior and posterior, proceed at nearly right angles. The front margin for nearly one-fourth of the height of the shell is nearly straight, thence turns rather abruptly backward at an angle of 130° to the middle of the ventral margin in a slightly convex line to the angular termination of the umbonal ridge. The umbonal ridge makes an angle of about 70° with the posterior part of the hinge line. In the type-specimen the flattened area back of the main umbonal ridge is crossed by a second slightly shorter, low ridge, neither ridge sharply defined, but expressed in the slight deflection of the concentric lines, and by flattening of the surfaces between them and between the latter and the posterior hinge margin. The termination of the second ridge causes a blunt angle in the posterior margin. The surface is marked by fine, concentric lines and occasional laminar foldings of the surface. The general surface is low-convex; the umbonal region low and flattened; the highest arching of the surface is subcentral.

Dimensions of type-specimen (a left valve): Length of hinge margin, 22 mm.; length across middle of shell, 24 mm.; posterior height, 20 mm.; height of front side, 9 mm.; main umbonal angle, 70° .

A right valve from the same locality shows the deflection of the concentric lines on the middle of the posterior slope, but the surface

does not show the low, angular elevations seen in the left valve. In this right valve the umbonal angle with the posterior part of the hinge is nearer 80° than 70° .

Locality.—East side Seward Neck.

Holotype and *paratype*.—Cat. No. 58437, U.S.N.M.

EURMYELLA ? SIMULANS, new species.

Plate 49, figs. 12, and 13.

Shell small, modiolopsoid in form, with straight hinge line, beak slightly arching over the hinge border, flattened, not prominent, situated about one-third distance back from front end of hinge. Posterior margin nearly at right angles with the cardinal margin; anterior end narrow. Umbonal ridge broad, not sharply defined. Posterior slope plano-convex to the posterior margin. In front of the umbonal ridge there is a broad, shallow furrow, producing a slight reentrant curve to the lower margin of the shell. This character, strictly speaking, removes the species from the genus *Eurymyella*, the entire absence of a mesial sulcus having been adopted as one of the distinctive characters of the genus. It is, however, placed in the genus because of the extremely close resemblance in all other particulars to the abundant representatives of the genus with which it appears associated. There is also the possibility that the appearance of the sulcus, which is quite distinct, may be the result of accident or of abnormal growth. Close examination of the smaller specimen shows a crack line in the bottom of the sulcus, and the larger specimen shows an angular projection of one of the growth-laminæ in the sulcus near the center of the shell. I am of opinion, therefore, that the peculiarity is either a varietal modification of a representative of the genus *Eurymyella* or that this character is due to accident. Surface covered by faint concentric lines and stronger occasional lines of growth.

Dimensions of the type-specimens are: (1) Length, 16 mm.; height, 11 mm. (2) Length, $23\frac{1}{2}$ mm.; height, 18 mm.

Locality.—East side of Seward Neck.

Cotypes.—Cat. No. 58438, U.S.N.M.

EURMYELLA PLANA, new species.

Plate 49, fig. 14.

Shell ovoid in outline, beak greatly depressed, surface gently convex, with greatest convexity in center of the shell. Both cardinal angles rounded, giving to the outline a subregular ovoid form. Surface markings fine, concentric lines, and occasional longer irregular growth lines.

Dimensions.—Greatest diameter from the antero-cardinal angle to the postero-ventral margin 25 mm.; greatest diameter at right

angles to this line and about one-quarter diameter in front of posterior margin 16 mm.; estimated depth of shell at middle not over 5 mm. The type-specimen is a left valve.

Locality.—East side of Seward Neck.

Holotype.—Cat. No. 58439, U.S.N.M.

EURYMYELLA RECTA, new species.

Plate 49, fig. 15.

Shell triangular, narrow, erect, higher than long; beak small, depressed, nearly central; hinge line short, straight; umbonal ridge low, convex, nearly central and nearly vertical to the hinge line; umbonal ridge trending about 10° posteriorly from the vertical.

Dimensions.—Greatest length at about 3 mm. below the hinge line, 16 mm.; height from beak to front 21 mm.

This species resembles *E. shaleri*, var. *brevia*, but differs by its depressed, flattened beak, indistinct umbonal ridge, more central position of the beak, and larger size. It bears closer genetic relationship to *E. angularis* and *E. plana*, with which it is associated in the same beds.

Locality.—East side of Seward Neck.

Holotype.—Cat. No. 58440, U.S.N.M.

EURYMYELLA CONVEKA, new species.

Plate 50, fig. 10.

Shell ovoid, oblique, convex; beak strong but not much produced beyond the hinge line, and situated about one-third way posterior to the front end of the hinge. Hinge line straight, shorter than the greatest length of shell, at posterior end sloping down gradually into the posterior margin; anterior ear narrow. Umbonal ridge broad, convex, highest near middle of shell, its axis forming an angle of about 45° with the posterior hinge line. The surface behind the umbonal ridge falls off rapidly to a broad, depressed area, gradually flattening to the tip of the broadly rounded cardino-posterior angle. The anterior ear is small, and from near its tip to the base of the umbonal ridge the margin trends in a broad, regular, convex curve to the ventral margin.

The type-specimen is a mold of the interior of a left valve, and shows the well-defined pit of the anterior muscular scar situate close in front of the ear and upon the hinge line. Three little scars are evident on the front side of the umbonal cavity, and a fourth just above and behind the muscular scar. An indistinct trace of an oblique tooth is evident under the beak, and near the posterior extremity of the hinge a short linear tooth about 3 mm. long is evident. The surface is marked by concentric lines and a few irregular concentric furrows.

The impression of this shell indicates a much stiffer and therefore thicker shell than in most of the representatives of the genus. From its association with the other species and its agreement in the exterior elements of form with the smaller species, I conclude that the development of evident hinge teeth is incident to the fuller development of the shell, and that it may be, generically, associated with the typical *Eurymyella*s with which it agrees in the entire absence of a mesial sulcus which is characteristic of the ordinary forms of *Modiolopsis* and *Modiomorpha*, to which genera these *Eurymyella*s have been frequently referred.

Dimensions.—The straight part of the hinge, length 15 mm.; length from front to back at 5 mm. below hinge line, 25 mm.; height at posterior end, 20 mm.; greatest diameter from tip of anterior ear to postero-ventral angle, 30 mm.

The type-specimen of this species was collected by N. S. Shaler and the specimen was identified as "*Modiomorpha* sp. *subulata*" by Shaler and later listed by H. S. Williams as *Modiomorpha* sp. *subulata* var. in United States Geological Survey Professional Paper, No. 35, page 24. The entire absence of the sulcus anterior to the umbonal slope and the discovery that the associated forms, generally of smaller size, are, with scarcely an exception, without this sulcus and present the general outward features of McCoy's *Anodontopsis* *augustifrons*, led to the founding of the new genus *Eurymyella* for the reception of this and associated species.

Locality.—Salt Works, Eastport.

Holotype.—Cat. No. 58448, U.S.N.M.

EURMYELLA DENBOWENSIS, new species.

Plate 50, figs. 11 and 14.

Shell subtriangular, obliquely elongate in the direction of the umbonal ridge; hinge line straight, shorter than length of the shell. Beak low, scarcely protruding beyond the hinge line, and situated near the front end. Umbonal ridge subangular, low, running from beak to postero-basal angle; lateral slopes subequal, flattened but slightly convex, no mesial sinus in front of umbonal ridge.

Surface marked by concentric lines of irregular size. Anterior muscular scar, strongly impressed near end and close up to the hinge; two or three small pits between it and the beak cavity. One or two small oblique teeth under the beak; linear thickening, but no distinct posterior lateral teeth are evident. The inner edge of the hinge-area somewhat strengthened at its posterior end.

Dimensions.—Greatest diameter from tip of front to extremity of the umbonal ridge of the type-specimen, 28 mm.; greatest diameter near center of shell at right angles to the umbonal ridge, 14 mm.;

straight part of hinge line about 14 mm. Two other specimens reach a greatest diameter of 35 and 40 mm., respectively.

The shell substance of this species is partially preserved in one specimen and the form is well preserved in all specimens seen, showing no evidence of crushing, thus differing from the other species of the genus from the higher formation.

Locality.—This species was found in an isolated outcrop near the end of Denbow Point, associated with brachiopods, trilobites, and cephalopods, thus indicating that it lived in marine conditions. In this respect *E. denbowensis* differs from all the other species of the genus here reported, associated with which the only known marine organisms are *Lingulas* and ostracods, signifying that their habitat was littoral, shallow waters, possibly estuarine.

Holotype and *paratype*.—Cat. No. 58449, U.S.N.M.

CLIOPTERIA, new genus.

A gibbous pterinoid shell, both valves highly arched with prominent over-arching beaks; nearly equivalved, inequilateral. The anterior slope of the right valve marked by one or two radiating, rounded, cord-like ridges and the left valve by corresponding furrows. The posterior slope smooth and more abrupt than the anterior side. Anterior ear small, separated by a shallow sulcus from the main body of shell. Posterior slope gradual and without distinct wing. A high, flattened, triangular area under the beak in both valves. Beaks of both valves overarching. In none of the specimens seen is the dentition of the hinge exhibited.

NOTE.—While this paper was being printed some specimens of *Cliopecteria uncosta* were discovered showing the mold of the hinge margin with distinct teeth. The following characters therefore may be added to the above definition of the genus, viz: Two short lateral teeth near the posterior end and two near the anterior end of the hinge of the right valve; one short strong lateral tooth at each end of the hinge of the left valve. In both valves the margin of the hinge between the lateral teeth is beset by sharply defined denticulations or small teeth.

Type-species.—*Cliopecteria bicostata* new species.

OBSERVATIONS ON THE GENUS CLIOPTERIA.

This genus is founded for some peculiar small pterinoid shells which bear considerable resemblance to the Devonian species *Avicula dispar* Sandberger as interpreted by Frech, and called by him *Kochia* (*Loxopteria*) *dispar* (Sandberger).¹ The name *Kochia* Frech was introduced to replace *Roemeria* Koch, which was preoccupied by Edwards and Haime, the type of which is *Roemeria capuliformis* Koch, to which our specimens present small resemblances. Frech then created the subgenus *Loxopteria* as a subgenus of *Kochia* to

¹ Die Devon Aviculiden Deutschlands, Abh. Geol. Specialk. Preuss., vol. 9, Heft. 3, 1891, p. 77, pl. 6, fig. 4.

include three species, of which *Kochia* (*Loxopteria*) *laevis* Frech is first mentioned. To this species our specimens also bear no close resemblance. The second species referred to the subgenus *Loxopteria* is Sandberger's *Avicula dispar*. The large valve of that species, as figured by Frech, bears considerable resemblance to the right valve of our species *Chiopteria bicostata* (see pl. 50, figs. 1 and 2).

Frech says ¹ of his genus:

Den Hauptunterschied zwischen *Kochia* und *Loxopteria* bildet somit die Gestalt der kleinen Klappe; dieselbe besteht bei beiden Gruppen aus zwei windschief zu einander gestellten Flächen, welche sich an einer diagonal verlaufenden Mittellinie berühren. Bei *Loxopteria* stoßen der Hinterflügel und der Haupttheil der Schale unter einen einspringenden, bei *Kochia* unter einen ausspringenden Winkel an einander; bei letzterer Gattung besteht die kleine Klappe aus einem steil abstürzenden Vordertheil und einer flügellosen Hinterseite.

The left valve of *Chiopteria*, as shown in figures 3 and 7, differs markedly from both *Kochia* and *Loxopteria* in the strong over-arching beak and its prominent umbonal ridge (as in the *Pterineas* with gibbous left valves) cut on the anterior side by a conspicuous longitudinal furrow.

The close affinity with *Pterinea* is shown by comparing the right valves (see figs. 2 and 4) with the corresponding valve of *Pterinea* as shown in our figure 5a of plate 50. The left valves also bear close resemblances, as seen by comparing figures 3 and 7 with figure 5. The chief difference is in the presence of the two longitudinal ridges on the anterior slope of the species *C. bicostata* and a single ridge in *C. unicastata* as shown in the figures 2 and 4 of plate 50. In external appearance the right valve resembles the right valve of the Triassic *Cassianella gryphæata* Münster from the St. Cassian beds.

CHIOPTERIA BICOSTATA, new species.

Plate 50, figs. 1, 2, 7.

Shell subtriangular, cardinal length shorter than height of shell; beak prominent, subcentral over-arching; area of right valve high, triangular, striated parallel to hinge margin. Anterior ear of right valve rounded, short but distinct; posterior cardinal extremity rounded but no distinct wing separate from the posterior slope of the surface.

From the beak of the right valve two strong cordlike ridges proceed toward the front, one near the umbonal ridge and separated from it by a narrow shallow sulcus; the other halfway down the anterior slope and separated from the first by a wide furrow and terminating at the middle of the anterior border (see fig. 2). A left valve of apparently the same species (see fig. 7) shows a deep furrow proceeding from tip of beak on the anterior side of the umbonal

¹ Die Devon Aviculiden Deutschlands, pp. 45-76.

ridge followed on its anterior side by a strong ridge on the anterior slope. Except for these ridges and furrows, the surface is apparently smooth.

Locality.—Limestone band in the shales at northwest corner of Youngs Cove, Pembroke Township.

Holotype.—Cat. No. 58441, U.S.N.M.

CLIOPTERIA UNICOSTA, new species.

Plate 50, figs. 3, 4, 6.

Right valve shorter and more gibbous than *C. bicostata*, and the cardinal area higher and broader. The umbonal slope arched and forming the highest part of the shell, in front of which and separated from it by a narrow furrow is a single cord-like ridge proceeding from tip of beak to the ventral margin, though this ridge less prominent and does not rise as high as the umbonal ridge; whereas in *C. bicostata* the ridge forms the highest elevation of the shell.

On the anterior slope there is a broad, shallow sulcus, the surface rising gently before reaching the ear, but not forming a distinct second cord-like ridge as in the other species. In the specimen figured (pl. 50, fig. 6) there is a narrow, triangular area separating the broad, flattened area under the beak from the curving posterior slope of the surface. This narrow triangular area is depressed and bounded on both sides by slightly raised lines. In another specimen this triangular area is curved and separates the flat cardinal area from the curving side of the shell and consists of two strong bounding thread-like ridges, between which are two finer parallel lines. The left valve is gibbous, but not as highly so as the right, and is marked on the anterior slope by a single low ridge separated by a faint narrow furrow from the umbonal ridge, which is broad and evenly rounded and separated from the small anterior ear by a broad, shallow sulcus.

The surface is smooth except for occasional concentric growth lines. In one mold of the exterior are seen also faint radiating lines. The two species are found in the same limestone and are clearly congeneric, the chief difference consisting in the long narrow form and more pronounced ridges of the one (*C. bicostata*) and the short gibbous form with fainter ridges of the other (*C. unicosta*).

Locality.—Limestone bands in the shales at northwest end of Young's Cove, Pembroke.

Cotypes.—Cat. No. 58442, U.S.N.M.

PTERINEA LAXATA, new species.

Plate 50, figs. 5 and 5a.

This species resembles *Avicula rectangularis* Sowerby in its general outline and in the form of the left valve. It is subtriangular, convex, with high subcarinated umbonal ridge; surface smooth; posterior margin nearly at right angles with the cardinal margin, broadly

rounded at the base. The beak, however, differs from Sowerby's species in its more central position and greater extension over the hinge area. The anterior and posterior slopes of the surface are nearly the same; a broad shallow sulcus separates the ear from the body of the shell. The right valve is convex; beak strong, narrow, and overarching; umbonal ridge at first narrow and subcarinate, but broadening out and flattening toward the base. The anterior slope is slightly concave between the umbonal ridge and the anterior ear. In one of the smaller specimens, a mold of the interior of a right valve, there is a rather sharp boundary to this sulcus, without, however, forming distinct ridges as in the case of *Chiopteria bicostata*. The dentition of hinge is as in *Pterinea*, with a long, somewhat curved linear posterior lateral tooth, and a few closely approximated oblique denticles under and a little anterior to the beak.

Locality.—The type-specimens are from the Silurian shales at the head of Leighton Cove, Pembroke, Washington County, Maine.

Cotypes.—Cat. No. 58443, U.S.N.M.

Genus STREPTOTROCHUS Perner.

Jaroslav Perner described the genus *Streptotrochus* in the year 1907,¹ as follows:

Coquille étroitement ombiliquée, à test mince et à tours légèrement aplatis, qu'on ne se touchent souvent un peu qu'à la base. Les tours possèdent une section transversale subtriangulaire et une périphérie anguleuse. Stries transverses écailleuses, faiblement courbées; plis en spirale, peu marqués.

Type: Streptotr. rugulosus Barr. sp. (pl. 106, figs. 11-15) (Gist. et local. Bande E2, Gross-kuchel, Lochkov.).

The author recognized the following species as congeneric: *Streptotrochus mercurius* (Barrande),² *Trochus incisus* Lindström,³ and with doubt *Trochus lundgreni* Lindström.⁴

To the genus *Streptotrochus* I refer some forms abundant in some of the shales on Moose Island associated with abundant representatives of the genus *Eurymyella*. Our species are smaller than the type-species from Bohemia and agree most nearly with Lindström's species *Trochus incisus*, but differ from that species in the less rapidly expanding spire. The form of the whorls is extremely variable, so that it is almost impossible to pick out any one specimen as a specific type to stand for other specimens crowded closely together with it on a single slab. In some of the more regular forms the resemblance to Lindström's figures of *Trochus incisus* (numbered 24 and 25 on his pl. 14) is very close. Our shells are slightly narrower and smaller in size.

¹ Syst. Sil. du Center Bohème, pt. 1, vol. 4, Gastéropodes, vol. 2, 1907, p. 233.

² Idem, p. 239, pl. 106, figs. 20-21.

³ Kongl. Svensk. vet.-acad. Handl., vol. 19, 1884, p. 151, pl. 14, figs. 22-31.

⁴ Idem, p. 149, pl. 14, figs. 46-53.

STREPTOTROCHUS IONE, new species.

Plate 50, fig. 13.

Shell small, thin, whorls six, including the initial protoconch, angle of spire about 45 degrees. The second, third, and fourth (counting the protoconch as one), are simply rounded; the fifth is rather sharply carinated about halfway between the sutures; the sixth and last whorl is (on the right side of the figure) at first rounded without carination, but toward the mouth becomes indented by a furrow corresponding to the posterior face of the preceding whorl. The surface is covered by concentric lines and occasionally more prominent ridges, irregular in size and in direction, but having the appearance of having formed the outer margin of the lip at successive stages of growth.

Locality.—On the west side of Shackford Head, Moose Island, Eastport, Maine.

Holotype.—Cat. No. 58447, U.S.N.M.

STREPTOTROCHUS REGULARIS, new species.

Plate 50, fig. 12.

This specimen is apparently made up of four whorls; the tip is broken. All of the whorls are convex and not carinated, but upon good exposure the whorls are seen to have a faint blunt angulation, and the outer whorl shows faintly the indentation more distinctly seen in the species *Streptotrochus ione*. The angle formed by the sides of the spire is approximately the same as in *Streptotrochus ione*. The surface markings consist of both the fine lines and the irregular larger concentric foldings which follow the direction of the edge of the lip.

Locality.—Same as *Streptotrochus ione*.

Holotype.—Cat. No. 58446, U.S.N.M.

STREPTOTROCHUS CARINATUS, new species.

Plate 50, fig. 8.

This specimen is more slender than *Streptotrochus ione*, the sides forming an angle of about 35 degrees. The smaller and initial whorl is absent, but from analogy there were probably six original whorls. The last three whorls are each distinctly carinated and the carination is near the outer side and suture of each whorl; the wider or right-hand side of the whorl is flattened and hollowed immediately below the carination, forming thus a broad shallow groove. This specimen is exfoliated and the characters are based upon the surface of the anterior mold. Other specimens, however, preserving the shell show the shell to have been very thin, and except for surface markings the interior molds show the form of the exterior surface.

Locality.—Same as *Streptotrochus ione*.

Holotype.—Cat. No. 58444, U.S.N.M.

STREPTOTROCHUS SULCATUS, new species.

Plate 50, fig. 9.

The type of this form is slightly crushed, but shows about the same size, angle, and number of whorls as in *Streptotrochus ione*. The first whorl visible (which is probably the second whorl) is simply convex, the third, fourth, fifth, and sixth whorls are each marked by distinct revolving groove or sulcus on the right side of the carina; and the carina on the outer, left side is strong but rather broad. The fine concentric lines are distinct, but the longer irregular concentric foldings seen in other specimens are wanting.

Locality.—Same as *Streptotrochus ione*.

Holotype.—Cat. No. 58445, U.S.N.M.

REMARKS ON THE SPECIES OF STREPTOTROCHUS.

In the above descriptions I have given the distinguishing characters of four specimens selected from a number exposed to view on a single slab of shale about 6 by 3 inches in dimensions. The locality from which the slab came is probably the same from which Shaler obtained the specimens called by him "*Murchisonia desiderata*?"¹

The specimens are not *Murchisonia*, and none of the specimens from the locality, or from anywhere on Moose Island, have the long slender spire of Hall's species mentioned by Shaler. The four figures given on plate 50 exhibit the general characters which are alike to such a degree that wherever found in the Eastport region, specimens can at once be located as belonging to this series. For convenience in description I have assumed that the series is a genus, and the different expressions of the type are different species; but also for convenience I have not described more specimens.

The form called *Streptotrochus carinatus* (pl. 50, fig. 8) is nearer to the type described by Lindstrom as *Trochus incisus* than the others; but our species *Streptotrochus sulcatus* (fig. 9) represents more nearly the dominant expression of characters presented by the Eastport forms. The other specimens illustrated are forms which occasionally appear and seem to be uncrushed forms of the shell. From the appearance of the fossils the shells were evidently quite fragile and have all suffered more or less by crushing after burial in the mud. The longitudinal furrowing of the whorls is almost universal, but it is varyingly expressed. The outer whorl of almost every specimen shows a trace of the furrow; in many it affects the next to last whorl, and (as in specimen called *Streptotrochus sulcatus*) the outer four whorls are distinctly sulcated. The sutures between the whorls are more or less deep, depending partly upon the abruptness of the left-hand slope from the main carination of the whorl, as seen in figure 8. All specimens are more or less strongly marked by concentric lines, and in some cases some of these lines are strengthened to form slight con-

¹ Amer. Journ. Sci., ser. 3, vol. 32, July, 1896, p. 56.

centric ridges, as shown in figure 13. On the specimens examined there is no constancy in expression of these ridges, and when present there seems to be no uniformity for the several whorls of the same shell. It is evident from the above that the characters upon which the four species are discriminated are quite inconstant.

EXPLANATION OF PLATES.

PLATE 49.

Eurymyella shaleri Williams.

FIG. 1. A right valve, natural size, not crushed. Shackford Head, Moose Island; collected by H. S. Williams.

2. A left valve, retaining the shell, crushed, natural size. Salt Works, Eastport; collected by N. S. Shaler.

3. A left valve, not much crushed, natural size. Salt Works, Eastport; collected by N. S. Shaler.

4. A right valve, natural size. On the east side of Seward Neck, near north Lubec landing, in thin bedded gray shale sandstone; collected by C. L. Breger.

Eurymyella shaleri, var. *brevia* Williams.

FIG. 5. A left valve, natural size.

6. A right valve, natural size.

7. A small left valve, natural size. Salt Works, Eastport; collected by N. S. Shaler.

Eurymyella shaleri, var. *longa* Williams.

FIG. 8. A left valve, natural size. East side of Seward Neck, near north Lubec landing; collected by C. L. Breger.

Eurymyella shaleri, var. *minor* Williams.

FIG. 9. A left valve, natural size. West side of Pleasant Point, Perry Township; collected by C. L. Breger.

Eurymyella angularis Williams.

FIG. 10. A left valve, natural size.

11. A right valve, natural size. East side Seward Neck; collected by C. L. Breger.

Eurymyella simulans Williams.

FIG. 12. A right valve, natural size.

13. A right valve, natural size. East side Seward Neck; collected by C. L. Breger.

Eurymyella plana Williams.

FIG. 14. A left valve, natural size. East side Seward Neck; collected by C. L. Breger.

Eurymyella recta Williams.

FIG. 15. A left valve, natural size, figure made from wax impression of the original. East side Seward Neck; collected by C. L. Breger.

PLATE 50.

Figures 8, 9, 12, 13 are magnified 2 diameters, all the others natural size.

Chlopteria bicostata Williams.

FIG. 1. Cardinal view of right valve, showing overarched beak and high flat area.
2. A right valve, showing the characteristic ridges on the anterior slope; the same specimen as fig. 1.

7. A left valve, showing the deep sulcus and single fold outside on the anterior slope. Specimens 1, 2, and 7, from limestone band, on the north shore of Youngs Cove, Pembroke, Washington County, Maine. Collected by C. L. Breger.

Cliopecteria unicosta Williams.

- FIG. 3. A left valve showing the beak and umbonal ridge with a shallow furrow and single ridge on the anterior slope.
4. A right valve, the single ridge separated by slight furrow from the umbonal ridge.
6. A right valve, same specimen as fig. 4, cardinal view showing the overarching beak and flat high area; locality same as for figs. 1, 2, and 7.

Pterinea laxata Williams.

- FIGS. 5 and 5a. Molds of the interior of a left and a right valve, introduced here for comparison with corresponding valves of *Cliopecteria* (figs. 7 and 2). Shales at the head of Leighton Cove, Pembroke, Maine. Collected by C. L. Breger.

Streptotrochus carinatus Williams.

- FIG. 8. An exfoliated specimen showing the interior surfaces of the whorls with angular carinae near the outer sulcus. Magnified 2 diameters. Shales in the cove on west side of Shackford Point on Moose Island, Eastport, Washington County, Maine.

Streptotrochus sulcatus Williams.

- FIG. 9. A partially exfoliated specimen, magnified 2 diameters, showing the revolving furrow and the concentric surface lines; collected by H. S. Williams.
- Locality same as fig. 5.

Eurymyella convexa Williams.

- FIG. 10. Mold of the interior of a left valve, natural size, showing the anterior muscular scar, umbonal and pedal scars, and, obscurely, a cardinal tooth under beak and a short oblique posterior tooth near hinge extremity. Salt Works, Eastport. Collected by N. S. Shaler.

Eurymyella denbowensis Williams.

- FIG. 11. A mold of the interior of front part of a right valve, natural size, showing the anterior muscular scar, umbonal and pedal scars, and the small oblique cardinal tooth under the beak. Southeast corner of Denbow Point, forming the northern extremity of Denbow Neck, Lubec Township, Washington County. Collected by C. L. Breger.
14. A nearly complete left valve, partially exfoliated, showing the anterior and pedal scars, the flattened cardinal area without lateral cardinal teeth, and the surface markings.
- Locality same as fig. 11.

Streptotrochus regularis Williams.

- FIG. 12. An uncrushed specimen, showing the outer surface of the shell and the sub-regular convexity of the body whorls. Magnified 2 diameters. Collected by H. S. Williams.
- Locality same as fig. 8.

Streptotrochus ione Williams.

- FIG. 13. A nearly perfect shell, showing the carination on the next to last whorl and sulcus on outer whorl and surface markings. Magnified 2 diameters. Collected by H. S. Williams.
- Locality same as fig. 8.

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SOME NEW SILURIAN MOLLUSKS.

FOR EXPLANATION OF PLATE SEE PAGE 397.



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SOME NEW SILURIAN MOLLUSKS.

FOR EXPLANATION OF PLATE SEE PAGES 397-398.

JAPANESE SHORE FISHES COLLECTED BY THE UNITED STATES BUREAU OF FISHERIES STEAMER "ALBATROSS" EXPEDITION OF 1906.

By JOHN OTTERBEIN SNYDER,
Of Stanford University, California.

This report deals mainly with the collections made by members¹ of the U. S. Bureau of Fisheries steamer *Albatross* expedition of 1906, who were detached from the ship and intrusted with a study of the shore fishes of Japan. It was intended that the shore party should direct its attention to the species inhabiting the tide pools and shallow water immediately offshore, and accordingly collecting stations were occupied where the coast was of such a nature that large areas were exposed at low tides, and where markets of considerable size were within reach. These stations included Hakodate, Mororan, and Otaru in Hokkaido, Same, Aikawa, Misaki, and Shimizu on the eastern coast of Hondo, and Kagoshima, Akune, and Tanegashima near the southern end of Kiusiu. A trip was also made to Okinawa, one of the Riu Kiu Islands, the results of which appear in a separate report.²

There are remarkably rich collecting grounds near Mororan, Misaki, and Tanegashima, where one finds small, quiet bays with sandy or muddy bottoms and gently sloping beaches, together with broad expanses of open coast where the waves have worn innumerable pot-holes and large pools in the surface of the soft rocks. Small fishes often fairly swarm in these pools³ and at low tide may be seen quietly swimming about or darting here and there among the broken rocks, corals, or masses of algæ. A good representation of the fish fauna of Japan may be secured at these places, the fishes of Mororan con-

¹ The shore work was mainly done by the writer and Mr. Michataro Sindo, a student of Stanford University, who is an enthusiastic collector and a good naturalist. Profs. S. Nozawa, S. Saito, and K. Otaki were each a volunteer member of the party for a time, and rendered valuable assistance.

² Proc. U. S. Nat. Mus., vol. 42, p. 487.

³ For example, a pool near Misaki, roughly measuring 19 feet in circumference and 3 feet at its deepest part, contained 123 specimens representing 16 different species. The pools in the vicinity of Misaki appear to support an unusually large number of species, and in addition to a rich native fauna there are many stragglers from the tropics, the young of various *Chaetodonts*, *Pomacentrids*, *Trutheids*, and others which appear to have drifted northward in the Kuroshio far beyond a point where the species are able to maintain themselves.

sisting largely of northern species related to those of the Kuriles and Kamchatka, those of Misaki and the great Tokyo market being typically Japanese, while at Tanegashima and Kagoshima the fauna is more tropical, many of the species ranging to the Philippines, East Indies, and the South Seas.

Care has been taken throughout the paper to designate species which are represented by individuals purchased in the markets, although it is quite probable that all such were taken by the local fishermen. The color notes were made from living examples, unless otherwise stated. The drawings were made by Messrs. William S. Atkinson and Sekko Shimada. The descriptions of the new species were published in previous volumes of these proceedings.

The writer wishes to express his appreciation of the interest shown by the Japanese officials with whom he came in contact, by the officers connected with the Imperial bureau of fisheries at various stations, especially Otaru, Tokyo, and Tanegashima, and by members of the zoological faculty of the Imperial University and the Misaki Biological station.

The writer is indebted to Dr. Charles H. Gilbert, naturalist in charge of the expedition, for many valuable suggestions. Dr. David Starr Jordan has been frequently consulted in matters pertaining to nomenclature.

Family PETROMYZONIDÆ.

ENTOSPHEUS JAPONICUS (Von Martens).

One very small example from Yamaguchi.

LAMPETRA PLANERI (Bloch).

Young examples of this species were collected in the Ishikara River at Sapporo.

Family HETERODONTIDÆ.

HETERODONTUS JAPONICUS (Duméril).

Misaki market.

Family SCYLLIORHINIDÆ.

HALÆLURUS RUDIS (Pletschmann).

A specimen from Hakodate measuring 420 millimeters has the white spots conspicuous on the posterior parts only.

Family GALEIDÆ.

MUSTELUS MANAZO Bleeker.

Otaru, Hakodate, and Kagoshima markets.

One example 4½ feet long was seen and carefully identified in the Hakodate market. A large specimen was also noted in the market at Tokyo.

TRIAKIS SCYLLIUM Müller and Henle.

Tokyo and Misaki markets.

Family SPHYRNIDÆ.

SPHYRNA ZYGÆNA (Linnaeus).

Tokyo market.

Family MITSUKURINIDÆ.

MITSKURINA OWSTONI Jordan.

After examining a figure of this species several fishermen at Mororan stated that it has been taken there.

Family SQUALIDÆ.

SQUALUS MITSUKURII Jordan and Snyder.

Mororan, Tomakomai, and Misaki markets.

Young examples have a row of white spots along the sides, each as long as the pupil. A spot similar to these is on the upper surface near base of first dorsal spine, another a little beyond base of fin, and a third below base of second spine.

ETMOPTERUS LUCIFER Jordan and Snyder.

Reported by fishermen as being occasionally caught near Mororan.

Family SQUATINIDÆ.

SQUATINA JAPONICA Bleeker.

Many large examples in the Tokyo market were said to have been caught by local fishermen.

Family NARCOBATIDÆ.

NARKE JAPONICA (Temminck and Schlegel).

Misaki and Kagoshima markets. Said to be rarely seen.

Family RAJIDÆ.

RAJA MEERDERVOORTI Bleeker.

Otaru, Mororan, and Hakodate markets.

DISCOBATUS SINENSIS (Bloch and Schneider).

Tokyo market.

Family DASYATIDÆ.

DASYATIS AKAJEI (Müller and Henle).

Otaru, Shiogama, Tokyo, and Misaki markets.

One example has two strong spines in the tail, one immediately behind the other; the back without thorny spines.

Color in life: Dorsal surface gray, growing yellowish toward the edges of disk; edges of snout, a narrow region below eyes, sides of tail, and edges of ventrals orange; ventral surface dead white, with six unsymmetrically arranged orange spots on the belly; edge of disk on under side, including snout and ventrals, bright orange.

PTEROPLATEA JAPONICA Temminck and Schlegel.

Tokyo market.

UROLOPHUS FUSCUS Garman.

Tokyo market.

Family ACIPENSERIDÆ.

ACIPENSER MIKADOI Hilgendorf.

Otaru and Hakodate markets.

A specimen from Otaru, 526 millimeters long, has 10 dorsal, 30 lateral, and 8 ventral plates. A stuffed skin from Hakodate 1,580 millimeters long has 10 dorsal, 33 lateral, and 9 ventral plates (8 on one side). Interposed between some of the larger dorsal plates are 5 smaller ones, 3 of which have reached a considerable size and with some additional growth might be enumerated with the others.

The following measurements are of the Otaru example: Head, 3.4 in length to base of caudal; depth, 7; depth caudal peduncle, 8.8 in head; snout, 1.7; eye, 14.5; interorbital space, 3.4; length pectoral, 2.2; height dorsal, 4.7; height anal, 4.2; length caudal, 1.3.

Family PTEROTHRISIDÆ.

PTEROTHRISUS GISSU Hilgendorf.

Tokyo market.

Family ALBULIDÆ.

ALBULA VULPES (Linnaeus).

Kagoshima market.

Family DOROSOMATIDÆ.

KONOSIRUS PUNCTATUS (Temminck and Schlegel).

Tokyo, Misaki, and Kagoshima markets.

Family CLUPEIDÆ.

STOLEPHORUS JAPONICUS (Houttuyn).

Nagasaki market.

AMBLYGASTER MELANOSTICTUM (Temminck and Schlegel).

Otaru, Mororan, Tomakomai, Hakodate, and Misaki; taken near shore in the seine.

SARDINELLA ZUNASI (Bleeker.)

Specimens were collected in the harbor at Nagasaki with the surface net at night. The following proportional measurements are from examples 120 millimeters long: Head, 4.2 in length to base of caudal; depth, 3.3; depth caudal peduncle, 9.5; eye, 2.7 in head; snout, 4.2; maxillary, 2.3; interorbital space, 4; D., 16; A., 18; scales in lateral series, 40. There is a single row of very minute teeth on each palatine bone, and a similar row on the hypobranchials, the tongue being naked. Adipose eyelids are present and well developed.

CLUPEA PALLASII Cuvier and Valenciennes.

Otaru market; Tomakomai with seine.

Family ENGRAULIDÆ.

ENGRAULIS JAPONICUS Temminck and Schlegel.

Otaru, Misaki, and Hakodate markets; Otaru, with the seine.

Family SALMONIDÆ.

PLECOGLOSSUS ALTIVELIS Temminck and Schlegel

Tokyo and Tsuruga markets.

Family SALANGIDÆ.

SALANG MICRODON Bleeker.

Same; taken in small seine.

Family ARGENTINIDÆ.

OSMERUS DENTEX Steindachner.

Tomakomai, seine; Hakodate and Mororan markets.

MESOPUS OLIDUS (Pallas).

Mori and Tomakomai, with the seine; Hakodate market.

There appears to be no difference between this species and *M. japonicus*. The ventrals show some slight variation in position. Some specimens have been found with 9 dorsal and 12 or 13 anal rays, and also with 10 dorsal and 13 to 15 anal rays. The dorsal rays number from 9 to 13, the anal 12 to 15.

Family SYNODONTIDÆ.

SAURIDA ARGYROPHANES (Richardson).

Tokyo market; Shimizu and Kagoshima, where specimens were seined near shore.

SYNODUS JAPONICUS (Houttuyn).

Misaki market.

TRACHINOCEPHALUS MYOPS (Forster).

Otaru, Tokyo, and Misaki markets; seined near shore at Shimizu and Kagoshima.

Family SILURIDÆ.

PARASILURUS ASOTUS (Linnaeus).

Tokyo market; Takamatsu R., Akune.

LIBAGRUS REINI Hilgendorf.

Yamaguchi.

PLOTOSUS ANGUILLARIS Lacépède.

Misaki, Kagoshima, and Tanegashima pools.

Individuals about 350 millimeters were usually abundant in the more shallow, sandy pools. In life they were brownish black, lighter and tinted with golden below; yellow lateral stripes; fins tinged with golden brown.

Family COBITIDÆ:

MISGURNUS ANGUILLICAUDATUS (Cantor).

Hakodate and Tokyo markets; Takamatsu R., Akune.

Specimens from Hakodate and Akune were very slender while those from Tokyo were deep and fat. There are often 8 rays in the dorsal and 7 in the anal.

COBITIS TENIA Linnaeus.

Nanao; Yamaguchi. In ditches near the rice fields.

ORTHRIAS OREAS Jordan and Fowler.

Thirty-two specimens of this species were collected in the Ishikari River at Sapporo. The head measures about 4.4 in the length to base of caudal; depth 6.5. There are 8 rays in the dorsal and 6 in the anal. The edge of the caudal is slightly emarginate and the upper and lower lobes are rounded.

Family CYPRINIDÆ.

CARASSIUS AURATUS (Linnaeus).

Niigawa; Same; Takamatsugawa, Akune; Yamaguchi; Dogo Island.

HEMIBARBUS BARBUS (Temminck and Schlegel).

Near Tokyo.

LEUCOGOBIO MAYADÆ (Jordan and Snyder).

Yamaguchi.

PSEUDOGOBIUS ESOCINUS (Temminck and Schlegel).

Yamaguchi.

ZEZERA HILGENDORFI (Ishikawa).

Yamaguchi; 3 specimens.

ACHEILOGNATHUS LANCEOLATUM (Temminck and Schlegel).

Yamaguchi.

ACHEILOGNATHUS LIMBATUM (Temminck and Schlegel).

Niigawa; Same.

ZACCO PLATYPUS (Temminck and Schlegel).

Takamatsugawa, Akune.

ZACCO TEMMINCKI (Temminck and Schlegel).

Yamaguchi.

RICHARDSONIUS HAKUENSIS (Günther).

Otaru market; Sapporo; Tomakomai; Hakodate market; Niigawa, Same; Aikawa; Dogo Island.

Family LEPTOCEPHALIDÆ.

The following key will serve to distinguish the Japanese species of the genus *Leptocephalus*.

- a*¹ Dorsal fin beginning at a point above or anterior to base of pectoral.
 - b*¹ Tail short, rather blunt, not more than 3.5 times length of head; dorsal and anal with black borders throughout.
 - c*¹ Pectorals pointed; eye small, 5.5 in head; fins narrowly bordered with black.....*anago*.
 - c*² Pectoral rounded; eye large, 4.7 in head; fins broadly and indistinctly bordered with black.....*flavirostris*.
 - b*² Tail long, very slender and pointed, about 4.5 times length of head; dorsal and anal with black borders only posteriorly.....*retroinctus*.
- a*² Dorsal fin beginning behind base of pectoral.
 - d*¹ Dorsal fin beginning at a point above or slightly anterior to middle of pectoral.
 - e*¹ Maxillary long, extending to posterior border of orbit.
 - f*¹ Dorsal and anal with black margins throughout; tip of tail black.....*riukiuanus*.
 - f*² Dorsal and anal with black margins only on posterior parts; tip of tail white.....*megastomus*.
 - e*² Maxillary short, not extending beyond posterior edge of pupil.
 - g*¹ Pectoral pointed; dorsal and anal with black margins posteriorly.....*nystroni*.
 - g*² Pectoral broadly rounded; dorsal and anal immaculate.....*heterognathos*.
 - d*² Dorsal fin beginning at a point behind middle of pectoral.
 - h*¹ Dorsal and anal with black borders.
 - i*¹ Lateral line with distinct whitish spots, as wide as the interspaces, one for each pore.....*myriaster*.
 - i*² Lateral line without white spots.
 - j*¹ Maxillary extending to posterior border of orbit; pectorals pointed.....*kusiuanus*.
 - j*² Maxillary extending only to posterior border of pupil; pectorals rounded.....*erebennus*.
 - h*² Dorsal and anal light, without black borders.....*japonicus*.

LEPTOCEPHALUS ANAGO (Temminck and Schlegel).

Misaki and Tokyo markets.

The dorsal is usually inserted directly above base of pectoral, although cases are sometimes seen where it is a little anterior or posterior.

LEPTOCEPHALUS FLAVIROSTRIS Snyder.

Plate 51, fig. 1.

Leptocephalus flavirostris SNYDER, Proc. U. S. Nat. Mus., vol. 35, 1909, p. 93.

Misaki; said to have come from near shore.

LEPTOCEPHALUS RETROINCTUS Jordan and Snyder.

Kagoshima market. This may be easily distinguished among other Japanese species by the very long pointed tail with its dense black fins.

LEPTOCEPHALUS MEGASTOMUS (Günther).

Yokohama market.

LEPTOCEPHALUS NYSTROMI Jordan and Snyder.

Tokyo and Kagoshima markets.

It is scarcely probable that this species and *L. heterognathus*¹ are synonymous, as suggested by Jordan and Richardson.² *L. nystromi* has long, pointed pectorals, and the dorsal and anal have black borders in the region of the tail. In *L. heterognathus* the pectorals are broadly rounded and the vertical fins are immaculate.

LEPTOCEPHALUS MYRIASTER (Brevoort).

Hakodate and Tokyo markets; seined in shallow water at Shiogama.

LEPTOCEPHALUS KIUSIUANUS Jordan and Snyder.

Misaki market.

LEPTOCEPHALUS KREBENNUS Jordan and Snyder.

Many specimens procured in the pools at Misaki.

Head, 1.6 in the trunk; head and trunk, 1.6 in tail; lower jaw usually equal to the upper in length, sometimes slightly included; maxillary, 2.5 in head; distance from gill opening to origin of dorsal, 2.3 in head; height of dorsal, 6 in head. Pectorals very broad; rounded in outline. Dorsal inserted near a point above tip of pectoral; sometimes an eye's diameter before or behind it.

Family MURÆNESOCIDÆ.

MURÆNESOX CINEREUS (Forakål).

Kagoshima.

Family OPHICHTHYIDÆ.

OPHICHTHUS ASAKUSÆ Jordan and Snyder.

A specimen examined in Yokahama had the origin of the dorsal above the anterior third of the pectoral.

PISOODONOPHIS ZOPHISTIUS Jordan and Snyder.

Misaki pools; Kagoshima market.

The dorsal and anal increase in height just before reaching tip of tail.

MICRODONOPHIS ERABO Jordan and Snyder.

One specimen obtained in a pool near Misaki. The original description of this species errs in stating that the head and trunk are a little shorter than the tail, the opposite being true. A young specimen from a pool at Misaki, apparently belonging to this species, was bright grayish olive in life, the dorsal bordered by pearly blue.

Family ANGUILLIDÆ.

ANGUILLA JAPONICA Temminck and Schlegel.

Mororan, Shiogama, Tokyo, Misaki, and Kagoshima markets; seined near mouth of river at Akune.

¹ Bleeker, *Vijf. Bijdr. Ichthyol. Japan*, p. 9, pl. 3, fig. 1.

² *Fishes Formosa*, Mem. Carnegie Mus., vol. 4, p. 172.

Family MURÆNIDÆ.

GYMNOTHORAX KIDAKO (Temminck and Schlegel).

Misaki Market; Tanegashima pools.

GYMNOTHORAX RETICULARIS Bloch.

Kagoshima market.

GYMNOTHORAX LAYSANUS (Steindachner).

One specimen from a tide pool at Tanegashima belongs without doubt to this species.

GYMNOTHORAX ODIOSUS Snyder.

Plate 51, fig. 2.

Gymnothorax odiosus SNYDER, Proc. U. S. Nat. Mus., vol. 35, 1903, p. 94.

A rather characterless species, with a heavy body, a short tail, and a high dorsal.

One specimen from Kagoshima.

AEMASIA LICHENOSA Jordan and Snyder.

An example from the pools at Misaki, measuring 380 millimeters, agrees with specimens previously described except for a slight difference in the length of the head, which is contained 2.7 times in the trunk, 7.5 in the total length. The teeth are markedly short and blunt in this specimen. A smaller individual was secured in the same locality.

Family POECILIIDÆ.

ORYZIAS LATIPES (Temminck and Schlegel).

Shiogama; Yamaguchi; Akune; Nanao; Dogo Island; in small streams and ditches.

Family PEGASIDÆ.

PEGASUS UMITENGU (Jordan and Snyder).

One small example dipped from surface near Shimizu.

Family SYNGNATHIDÆ.

SYNGNATHUS SCHLEGELI Kaup.

Mori; Same; Misaki; taken near shore with a small seine.

SYNGNATHUS YOSHI (Snyder).

Plate 51, fig. 3.

Siphostoma yoshi SNYDER, Proc. U. S. Nat. Mus., vol. 36, 1909, p. 597.

CORYTHOICHTHYS TANAKÆ Jordan and Starks.

Tanegashima; many females and a few males were taken in the pools. A well-developed anal fin is present. The males have larger head tentacles than the females, while there are rows of tentacles present along the lateral ridges of the body in both sexes.

CORYTHOICHTHYS QUINQUARIUS Snyder.

Plate 52, fig. 1.

Corythoichthys quinquarius SNYDER, Proc. U. S. Nat. Mus., vol. 40, 1912, p. 526.

Tanegashima, Japan.

Thirteen specimens, one male and twelve females, were secured by seining in shallow water. All are much alike in color. The dorsal covers 6.5 to 7 rings. The dorsal rays number from 26 to 28.

TRACHYRHAMPHUS SERRATUS (Temminck and Schlegel).

Misaki; one specimen from a pool.

UROCAMPUS RIKUZENIUS Jordan and Snyder.

One specimen was taken in Matsushima Bay where the species was first seen. In this example the dorsal fin is confined to 4 rings. Otherwise it is like the type.

MICROPHIS OCELLATUS Snyder.

Tanegashima pools, where the species appear to be rare.

MICROPHIS BRACHYURUS (Bleeker).

Three specimens taken with the seine near shore at Tanegashima do not appear to differ from Samoan examples.

HIPPOCAMPUS JAPONICUS Kaup.

Shiogama; Tsuruga.

HIPPOCAMPUS MOHNIKEI Bleeker.

Misaki.

HIPPOCAMPUS CORNATUS Temminck and Schlegel.

Misaki.

Family AULORHYNCHIDÆ.

AULICETHYS JAPONICUS Brevoort.

Hakodate, Shiogama, and Misaki; collected with the seine.

In life dark brown or dark olive above, brassy below; small pearly spots along the sides.

Family FISTULARIIDÆ.

FISTULARIA PETIMBA Lacépède.

Misaki market; Shimizu, seined in shallow water.

The interorbital area is almost flat; ridges and serrations weak.

FISTULARIA SERRATA Cuvier.

Shimizu; collected with the seine in shallow water.

The specimens identified with this species have a deeply concave interorbital area, the ridges of the snout more pronounced and the serrations of the same better developed. The body is deeper, the caudal peduncle broader, and the lateral line much more strongly armed posteriorly. The snout is longer, deeper, and heavier.

Family GASTEROSTEIDÆ.

GASTEROSTEUS CATAPHRACTUS (Pallas).

Tomakomai.

PGOSTEUS TYMENSIS (Nikolsky).

Sapporo; Tomakomai; taken in fresh water with the seine.

Family EXOCOETIDÆ.

CYSELURUS AGOO (Temminck and Schlegel).

Aikawa and Tokyo markets.

CYSELURUS POECILOPTERUS (Cuvier and Valenciennes).

Three specimens identified with this species were found in the market at Tokyo. The pectorals have elongate, blackish spots with dusky borders, arranged in transverse rows which become more or less zigzag near the end of the fin. The membranes of the lower 5 or 6 rays are unspotted. The other fins are immaculate or slightly dusky. The tip of the pectoral is formed by the third ray; the first ray is simple, the second branched and longer, its tip being about half way between that of the first and third. Head, 4.6 in length to base of dorsal; depth, 4.8; depth caudal peduncle, 2.7 in head; eye, 2.5; snout, 4.2; interorbital space, 2.5; D. 12; A. 8; P. 16.

Family HEMIRHAMPHIDÆ.

HYPHORHAMPHUS SAJORI (Temminck and Schlegel).

Otaru; Kagoshima.

The following measurements were made from a specimen 300 millimeters long: head, 4.9 in the length to base of caudal; head from lower jaw, 3.3; depth, 9; snout, 2.4 in head; eye, 5; interorbital space, 4.5. One 140 millimeters long measures as follows: head, 4.5; head from lower jaw, 2.5; depth, 11; snout, 2.5 in head; eye, 4.5; interorbital space, 4.2.

Many small specimens were dipped from the surface at Otaru, having been attracted by the ship's lights.

Family ESOCIDÆ.

TYLOSURUS ANASTOMELLA (Cuvier and Valenciennes).

Echigo, Tokyo and Kagoshima markets.

TYLOSURUS GIGANTEUS (Temminck and Schlegel).

Kagoshima market.

Family SPHYRAENIDÆ.

SPHYRAENA JAPONICA Cuvier and Valenciennes.

Tokyo and Kagoshima markets.

SPHYRAENA PINGUIS (Günther).

Hakodate market.

Doctor Jordan recognizes 3 species of *Sphyraena* in Japan, separating them thus:

Scales about 95.....*pinguis*.

Scales 110 to 125.

Fins pale, ventrals behind dorsal.....*japonica*.

Fins black, ventrals before dorsal.....*nigripinnis*.

Specimens of *S. nigripinnis* were not seen.

Family MUGILIDÆ.

MUGIL CEPHALUS Linnaeus.

Misaki pools; Tokyo market.

LIZA HÆMATOCHILA (Temminck and Schlegel).

Tokyo market.

Family MONOCENTRIDÆ.

MONOCENTRUS JAPONICUS Houttuyn.

Misaki.

Family BERYCIDÆ.

BERYX SPLENDENS Lowe.

Misaki.

Family TRACHICHTHYIDÆ.

GEPHYROBERYX JAPONICUS (Döderlein).

Shimizu market.

HOPISTETHUS MEDITERRANEUS Cuvier and Valenciennes.

Kagoshima market.

Family HOLOCENTRIDÆ.

HOLOCENTRUS RUBER (Forsk.).

Tanegashima.

HOLOCENTRUS SAMMARA (Forsk.).

Tanegashima. The lateral stripes are pale but the dorsal spot is jet black.

MYRIPRISTIS MACROLEPIS Bleeker.

Tanegashima market.

Family POLYMIXIIDÆ.

POLYMIXIA JAPONICA (Steindachner.)

Shimizu market.

Family SCOMBRIDÆ.

SCOMBER JAPONICUS Houttuyn.

Otaru and Hakodate markets.

EUTHYNNUS PELAMIS (Linnaeus).

Misaki market.

EUTHYNNUS ALLETERATUS (Rafinesque).

Tokyo and Kagoshima markets.

Family RUVETTIDÆ.

ACANTHOCYBIUM SOLANDRI (Cuvier and Valenciennes).

Misaki market.

JORDANIDIA RAPTORIA Snyder.

Plate 52, fig. 2.

Jordanidia raptoria SNYDER, Proc. U. S. Nat. Mus., vol. 40, 1912, p. 527.

Tanegashima market.

Family TRICHIURIDÆ.

TRICHIURUS JAPONICUS Temminck and Schlegel.

Tokyo and Kagoshima markets.

Color in life, bright silvery with metallic reflections; the fins transparent.

TRICHIURUS HAUMELA (Forssk.).

Tokyo market.

Two orange stripes along the sides, the lower bordering the lateral line.

Family CARANGIDÆ.

SCOMBROIDES ORIENTALIS (Temminck and Schlegel).

Kagoshima market.

SERIOLA AUREOVITTATA Temminck and Schlegel.

Aikawa, Misaki, Tsuruga, and Kagoshima markets.

Several specimens are identified with doubt as the above species.

SERIOLA PURPURASCENS Temminck and Schlegel.

Tokyo, Misaki and Kagoshima markets.

DECAPTERUS MUROADSI (Temminck and Schlegel).

Tokyo and Misaki markets.

TRACHURUS JAPONICUS (Temminck and Schlegel).

Otaru, Hakodate, Aikawa, Tokyo, Misaki, and Kagoshima markets.

CARANX EQUULA Temminck and Schlegel.

A specimen 170 millimeters long from Kagoshima has 6 or 7 very faint dark bars extending downward from the darker upper half of the body. These bands are more prominent on smaller examples.

CARANX DELICATISSIMUS Doderlein.

One example from Misaki apparently belongs to this species.

CARANX FLAVOCAERULEUS Temminck and Schlegel.

Kagoshima market.

Examples of this species may be easily distinguished from those of *C. ignobilis*, which they resemble, by the sharper snout. The young of *C. flavocaeruleus* are conspicuously barred.

CARANX IGNOBILIS (Forssk.).

Kagoshima market.

The specimens here identified as *C. ignobilis* appear to agree in all details of structure with those from Hawaii described and figured by Jordan and Evermann.¹

CARANX ARMATUS (Forssk.).

Kagoshima market.

ALECTIS CILIARIS (Bloch).

Misaki market.

When compared with examples of *A. major* from Formosa, specimens of this species may be recognized at a glance by the heavier body, smaller head, which is much broader between the eyes, and the darker dorsal surface with the distinct curved lateral bands.

¹ Fishes, Hawaii, p. 188, fig. 72.

Family LEIOGNATHIDÆ.

LEIOGNATHUS ARGENTIUM Lacépède.

Suruga market.

LEIOGNATHUS RIVULATUM (Temminck and Schlegel).

Kagoshima market.

Family LAMPRIDÆ.

LAMPRIS REGIA Bonastierre.

A large specimen was examined in the Aomori market. The color was dark bluish gray, growing lighter and becoming silvery beneath; body with small white spots with dusky borders; fins and lips bright red. D. 49; A. II, 36; P. 18; V. 15. The Japanese name is *Mombo*.

Family STROMATEIDÆ.

PSENOPHIS ANOMALA (Temminck and Schlegel).

Tokyo market.

Family PEMPHERIDÆ.

CATALUFA UMBRA Snyder.

Plate 52, fig. 3.

Catalufa umbra SNYDER, Proc. U. S. Nat. Mus., vol. 40, 1912, p. 528.

One specimen from Misaki.

Family CHEILODIPTERIDÆ.

APOGONICHTHYS CARINATUS (Cuvier and Valenciennes).

Shimizu market.

AMIA NIGRA (Döderlein).

Shimizu and Kagoshima markets.

AMIA MARGINATA (Döderlein).

Kagoshima market.

AMIA UNICOLOR (Döderlein).

One small specimen from the pools at Tanegashima. In life the body is strongly suffused with bright red, the color more intense and clear on the fins. The first dorsal spine is minute and almost concealed beneath the scale preceding it.

AMIA LINEATA (Temminck and Schlegel).

Tokyo market; Misaki pools; Nanao market.

AMIA SEMILINEATA (Temminck and Schlegel).

Misaki pools; Shimizu, seined in shallow water.

AMIA NOTATA (Houttuyn).

Kagoshima market; Tanegashima pools.

AMIA KIENSIS (Jordan and Snyder).

Seined in shallow water near Shimizu.

SCOMBROPS BOOPS (Houttuyn).

Tokyo market.

Family *AMBASSIDÆ*.*AMBASSIS LATA* Jordan and Seale.

Young examples of this species measuring about 45 millimeters in length were taken in the pools at Tanegashima. They appear to be like Samoan examples in every particular except that the eye is somewhat larger and the third dorsal spine is slightly longer.

Family *KUHLIIDÆ*.*BOULANGERINA TÆNIURA* (Cuvier and Valenciennes).

Misaki and Tanegashima pools.

It appears that the young only live in the pools, the specimens there found usually measuring about 50 millimeters.

Family *SERRANIDÆ*.*MALAKICHTHYS GRISEUS* Döderlein.

Kagoshima market. Three specimens. The pectorals extend to origin of anal fin.

LATEOLABRAX JAPONICUS (Cuvier and Valenciennes).

Tokyo, Misaki, and Kagoshima markets.

BRITTOSUS KAWAMEBARI (Temminck and Schlegel).

Yamaguchi.

STEREOLEPIS ISCHINAGI (Hilgendorf).

Young examples from the markets at Otaru and Hakodate.

AULACOCEPHALUS TEMMINCKI Bleeker.

One example from the market at Shimizu.

EPINEPHELUS CHLOROSTIGMA (Cuvier and Valenciennes).

Kagoshima market.

EPINEPHELUS CRASPIDURUS Jordan and Richardson.

Kagoshima market.

EPINEPHELUS AKAARA (Temminck and Schlegel).

Tokyo market.

The teeth become more numerous with increasing age, the patch of fine teeth present on the anterior part of the jaws of younger individuals growing wider and extending backward as the body increases in size. The maxillary extends far beyond the orbit in large examples while in smaller ones it scarcely reaches it.

One specimen has 4 rather definite dark, saddle-shaped bars on the back.

EPINEPHELUS FARIO (Thunberg).

The young of what appears to be this species were taken at Misaki. There are 2 well marked black blotches at the base of the spinous dorsal.

EPINEPHELUS EPISTICTUS (Temminck and Schlegel).

A specimen from Misaki measuring 380 millimeters, differs in color from that figured by Jordan and Richardson. There are 2 sharply defined, dark stripes passing backward from the eye, one to the upper edge of the pectoral where it ends, the other midway between the latter and angle of opercle, from where it turns downward and then extends backward as a row of small, closely apposed spots along the side of body to base of caudal. A stripe originates on upper edge of opercle and extends along body to caudal; like the above, after leaving the head, it is made up of spots more or less closely apposed, and posteriorly it is broken up into reticulations. Above these fairly definite stripes are numerous spots, each of which is about as large as a scale. A dusky band, narrow in front and broadening posteriorly extends along side of head just above maxillary to edge of preopercle.

EPINEPHELUS POECILONOTUS (Temminck and Schlegel).

Misaki market. One specimen has 15 dorsal rays. The color pattern is that illustrated by Temminck and Schlegel, the dark region of the spinous dorsal extending downward on the back forming a large oval spot not connected with the longitudinal stripes.

EPINEPHELUS MOARA (Temminck and Schlegel).

Misaki pools; Shimizu market.

EPINEPHELUS SEPTEMFASCIATUS (Thunberg).

Misaki.

EPINEPHELUS CÆRULEOPUNCTATUS (Bloch).

Tanegashima pools.

CHELIDOPERCA HIRUNDINACEA (Cuvier and Valenciennes).

One specimen from Tanegashima.

ANTHIAS MARGARITACEUS Hildebrandt.

Three specimens measuring about 100 millimeters in length were taken in a pool at Misaki. There is a dense, black blotch on the posterior part of spinous dorsal. The species is said to inhabit deep water, its occurrence in a pool being unusual.

PSEUDANTHIAS VENATOR Snyder.

Plate 53, fig. 1.

Pseudanthias venator SNYDER, Proc. U. S. Nat. Mus., vol. 40, 1912, p. 529.

One specimen from the Kagoshima market. This species is somewhat like *Anthias nobilis* lately described by Franz,¹ but its maxillary is broader and longer, the spinous dorsal is much lower, and there are other differences including color pattern.

SAYONARA SATSUMÆ Jordan and Seale.

Two specimens from the Kagoshima market.

¹ Abh. der Math. Phys. Klasse der k. bayer. Akademie der Wissenschaften, vol. 4, 1910.

Family THERAPONIDÆ.

THERAPON OXYRHYNCUS Temminck and Schlegel.

Tokyo, Shimizu, and Kagoshima markets; Akune, where specimens were secured with the seine.

THERAPON SERVUS Bloch.

Several specimens from the market at Kagoshima.

PLECTORHYNCHUS PICTUS (Thunberg).

One small specimen from the market at Kagoshima.

PARAPRISTOPOMA TRILINEATA (Thunberg).

Tokyo and Misaki markets.

Family SPARIDÆ.

SPARUS LATUS Houttuyn.

Tokyo and Kagoshima markets.

SPARUS ARIES Temminck and Schlegel.

Tokyo market; Shimizu; Kagoshima.

TAIUS TUMIFRONS Temminck and Schlegel.

Kagoshima market.

EVYNNIS CARDINALIS (Lacepede).

Aikawa, Misaki, Tokyo, and Kagoshima markets; also observed in the markets of Otaru, Mororan, and Hakodate, where specimens shipped from the south were offered for sale.

GYMNOCRANIUS GRISEUS (Temminck and Schlegel).

Tokyo, Misaki, and Nagasaki markets.

ENTHYOPTEROMA VIRGATUM (Houttuyn).

Tokyo and Kagoshima markets; Shimizu, with the seine.

ENTHYOPTEROMA BATHYBIUM (Snyder).

Nemipterus bathybius SNYDER, Proc. U. S. Nat. Mus., vol. 40, 1912, p. 532, vol. 41, p. 566, fig. 6.

Kagoshima market.

Family KYPHOSIDÆ.

GIRELLA PUNCTATA Gray.

Misaki, Akune, Kagoshima, and Tanegashima pools. Common in the pools at Akune, where it is associated with *G. melanichthys*, a species not represented in such large numbers.

GIRELLA MELANICHTHYS (Temminck and Schlegel).

Tokyo market; Misaki pools; Akune and Tanegashima.

A specimen 360 millimeters long from the Tokyo market has 15 dorsal spines, 64 scales in the lateral series, and a broad dusky edge on the opercle.

GIRELLA MEZINA Jordan and Starks.

Small examples were taken in the Misaki pools.

Family GERRIDÆ.

XYSTEMA ERYTHROURUM (Bloch).

Tanegashima pools.

Family SCIAENIDÆ.

SCIAENA MITSUKURII (Jordan and Snyder).

Tokyo market.

SCIAENA SCHLEGELI (Houtuya).

Kagoshima market.

Family OPLEGNATHIDÆ.

OPLEGNATHUS FASCIATUS (Temminck and Schlegel).

Hakodate and Tokyo markets; Tanegashima pools.

Family HISTIOPTERIDÆ.

EVISTIAS ACUTIROSTRIS (Temminck and Schlegel).

Tokyo market.

HISTIOPTERUS TYPUS Temminck and Schlegel.

One specimen seen in the Tokyo Market, where it is said to be rare.

Family PRIACANTHIDÆ.

PRIACANTHUS JAPONICUS Temminck and Schlegel.

Tokyo and Misaki markets.

PRIACANTHUS HAMRUR (Forssk.).

Misaki. In life, brilliant red with a bright metallic sheen; the fins darker, especially toward the tips. The bright color fades after death, dark bars then appearing on the back. In life only the merest trace of the bars is apparent.

Family MULLIDÆ.

UPENEOIDES TRAGULA Richardson.

Kagoshima market; Tanegashima pools.

Color in life: Body with a reddish brown lateral stripe, above which it is light greenish with a brassy tinge, the scales variegated with reddish brown; below, whitish, tinged with yellowish and greenish, variegated with spots of brown and light cherry red; under parts white; barbels orange; dorsals yellowish, clouded with brown and cherry red; spinous dorsal with an orange spot; caudal lemon yellow, barred with red, becoming darker below; deep brown on lower lobe; ventrals and anal lemon yellow, indistinctly clouded with red; pectorals barred with yellow and red.

UPENEOIDES SULPHUREUS (Cuvier and Valenciennes).

Kagoshima market.

UPENEOIDES BENSASI (Temminck and Schlegel)

Misaki, Shimizu, and Kagoshima markets.

Family APLODACTYLIDÆ.

GONIISTIVUS ZONATUS Cuvier and Valenciennes.

Misaki market.

Family POLYNEMIDÆ.

POLYDACTYLUS AGONASI Jordan and McGregor.

Kagoshima market.

Family SILLAGINIDÆ.

SILLAGO JAPONICA Temminck and Schlegel.

Misaki, Tokyo, Shimizu, Kagoshima, and Tsuruga markets.

SILLAGO PARVISQUAMIS GIL.

Tokyo market.

Family LATILIDÆ.

LATILUS JAPONICUS (Houttuyn).

There are at least 2 distinct species of *Latilus* in Japan. One may be recognized by its large eye (3.4 in head), and by the presence of a narrow, black stripe which occupies a sharp, median ridge extending from the interorbital area to the base of the dorsal. This is *L. ruber* Kishinouye.¹ The other has a much smaller eye (4.1 in head), while the region of the occiput and nape is immaculate. It is quite probable that the latter is *L. japonicus*, the species described by Houttuyn,² Cuvier and Valenciennes,³ and by Temminck and Schlegel. Each describes the color, not mentioning a black nuchal stripe. Temminck and Schlegel's figure⁴ portrays the small eye and immaculate nape. Jordan and Snyder also refer to this species.⁵

Doctor Kishinouye of the Imperial University furnishes the following description of the color: "Pinkish, with many transverse yellow bands on the side; 2 or 3 wavy, yellow lines near to and parallel with the posterior margin of the caudal; region between the occiput and origin of dorsal pale gray."

The species appears to be rather rare. Two examples were secured, one in the Tokyo market and the other at Shimizu.

LATILUS RUBER Kishinouye.

In a paper published in Japanese by Dr. K. Kishinouye⁶ the species distinguished by the black nuchal stripe and large eye is described. The author furnishes the following translation:

D. VIII, 15; A. 13; scales 7, 22; 67; vertebrae 24; head $4\frac{1}{2}$ in the total length; eye 3 in length of head.

The tip of pectoral reaches a vertical from the fourth ray of dorsal, while the tip of the latter, when depressed reaches a little beyond the base of the caudal fin. The

¹ Zoological Magazine, Tokyo, vol. 19, Feb., 1907.² Holl. Maats. Wet. Harlem, vol. 20, 1872, p. 311.³ *L. argentatus*, Nat. des Poissons, vol. 5, p. 368, and vol. 9, p. 465.⁴ Fauna Japonica, pl. 28, fig. 2.⁵ Proc. U. S. Nat. Mus., vol. 24, 1902, p. 459.⁶ Zoological Magazine, Tokyo, vol. 19, Feb., 1907.

posterior end of the ethmoid appears as a long, narrow process between the anterior part of the frontal bones. The hæmal process of the first caudal vertebra is strong, nonflexible, and is curved a little anteriorly.

The color is bright red, with many transverse yellow bands. There are two longitudinal yellow bands in the caudal fin. They originate at the base of the caudal and gradually approach each other toward the posterior margin of the fin. On the upper part of the fin there are two or three short, yellow bands, while the lower half is pale blue. There is a median, black stripe between occiput and origin of dorsal, the lateral boundaries of which are very distinctly marked. More of a literal species than the preceding.

This is the species figured and described by Otaki, Fujita, and Higurashi.¹

Numerous specimens were secured in the Tokyo market. Two were purchased at Kagoshima.

Family CEPOLIDÆ.

CEPOLA SCHLEGELI Bleeker.

A specimen measuring 300 millimeters was found in the Tokyo market.

Head, 9.2 in the length to base of caudal; depth, 12.5; snout, 5 in head; eye, 3.3; maxillary, 2.3; width interorbital space, 5.3; D. 68; A. 55; P. 19. The maxillary extends to a point below posterior border of pupil. There is a single row of curved canine teeth in each jaw, beyond which, on the lower jaw, are 3 strong teeth on each side of the symphysis. The head is entirely naked. The pectoral is broadly rounded, its length contained 2.1 times in the head.

ACANTHOCEPOLA KRUSENSTERNI (Temminck and Schlegel).

Shimizu, Mitajiri, Kagoshima, and Nagasaki markets. The dorsal has from 80 to 84 and the anal 78 to 80 rays.

Family EMBIOTOCIDÆ.

DITREMA TEMMINCKI Bleeker.

Same, Aikawa, and Misaki pools; Otaru and Tokyo markets.

NEODITREMA RANSONNETI Steindachner.

Hakodate and Misaki markets; Aikawa.

Several specimens measured 150 millimeters in length.

Family POMACENTRIDÆ.

CHROMIS NOTATUS (Temminck and Schlegel).

Misaki pools; Tokyo market.

ABUDEFDUF SORDIDUS (Forssk.).

Misaki and Tanegashima pools. Only young examples of this species were found. They were common in the pools at Tanegashima. Fifteen specimens were collected at Misaka, the largest of which measures 55 millimeters.

¹ *Fishes, Japan*, vol. 1, No. 1, 1903.

ABUDEFDUF SAXATILIS (Linnaeus).

Misaki and Tanegashima pools. None but small specimens were seen.

ABUDEFDUF BENGALENSIS (Bloch).

Tanegashima pools. The two specimens collected agree with the figure published by Day.¹

ABUDEFDUF SEKFASCIATUS (Lacépède).

Tanegashima pools. One small individual.

ABUDEFDUF CLARKI Snyder.

Plate 53, fig. 2.

Abudehduf clarki SNYDER, Proc. U. S. Nat. Mus., vol. 40, 1912, p. 534.

Pools at Misaki.

ABUDEFDUF ZONATUS (Cuvier and Valenciennes).

Tanegashima pools; 4 specimens, the largest measuring 35 millimeters.

ABUDEFDUF ANTJERIUS (Kuhl and Van Hasselt).

Tanegashima pools; 3 specimens.

This is a very brightly colored species, the brilliant hues fading rapidly after death. The body is yellowish olive, darker above, with a purplish tinge on region between anal and spinous dorsal, becoming orange on caudal peduncle and tail, lighter and grayish in region covered by pectoral, and on belly; chin, throat, and breast bluish gray; pores of lateral line yellow; eye very dark, with a conspicuous dash of white on the iris below pupil; a purple stripe bordered by dusky extending from eye to dorsal and then along base of fin and finally joining an ocellus on posterior part of spinous dorsal; base of soft dorsal with a purple edged ocellus on its posterior end; dorsals purplish brown above which is a narrow orange stripe, then one of purple which in turn is followed by an orange edge; anal yellowish olive narrowly edged with blue; pectorals orange; ventrals suffused with orange, the spine bluish.

ABUDEFDUF GLAUCUS (Cuvier and Valenciennes).

One young individual from a pool at Misaki, and numerous specimens from the pools at Tanegashima measuring from 20 to 65 millimeters in length.

ABUDEFDUF AMABILIS (De Vis).

One specimen from a pool at Tanegashima.

Family LABRIDÆ.

CHOERODON AZURIO (Jordan and Snyder).

Misaki, Shimizu, and Kagoshima markets.

Occasionally small (75 to 100 millimeters long) specimens may be found without posterior canine teeth. Some examples have 28 scales in the lateral line.

¹ Fishes India, pl. 23, fig. 2.

SEMICOSSYPHUS RETICULATUS (Cuvier and Valenciennes).

One young specimen was found in the Tokyo market.

DUTMERIA FLAGELLIFERA (Cuvier and Valenciennes).

Tokyo and Nagasaki markets.

Young examples have the head markedly larger than adults, an example 120 millimeters long having the head contained but 2.5 times in the length to base of caudal.

PSEUDOLABRUS JAPONICUS (Houttuyn).

Tokyo, Misaki, Shimizu, Tsuruga, and Nagasaki markets.

PSEUDOLABRUS GRACILIS (Steindachner).

Shimizu market. A specimen about 90 millimeters long has 6 converging, oblique, blackish lines on the caudal peduncle. Another example has a small, sharply outlined, black spot on membrane of dorsal fin between first and second dorsal spines.

STETHOJULIS STRIGIVENTER (Bennett).

One specimen from a pool at Tanegashima.

Color in life olive above, silvery below, bluish on breast and abdomen, tinged with purple on lower part of head; a pearly blue line below eye, narrowly bordered with brown; lower half of body with alternating stripes of silver and olive; a small brownish black spot on caudal peduncle; dorsal pale orange, narrowly edged with pearly white, a dark spot on posterior part bordered by a ring of transparent membrane; middle of caudal suffused with orange, the outer rays tinted with blue; anal like dorsal; pectorals pinkish; ventrals bluish. Specimens examined (mostly from Okinawa) appear to have no posterior canine.

STETHOJULIS KALOSOMA (Bleeker).

Stethojulis terina JORDAN and SNYDER, Proc. U. S. Nat. Mus., vol. 24, 1902, p. 631.

Stethojulis zatima JORDAN and SEALE, Proc. U. S. Nat. Mus., vol. 28, 1906, p. 788.

Some small fishes, 30 to 40 millimeters long, from the rock pools at Misaki are identified as the young of the above species. The smaller ones have a distinct spot at the base of the caudal just above the lateral line, and an ocellus on the soft dorsal. There is a dusky stripe from snout to caudal below which are several rows of dark spots, one on each scale, and a black dot on each side of the tip of the snout.

These specimens are in all respects like a cotype of *S. zatima* Jordan and Seale, and they agree with the description of the species. The figure of *S. zatima* is probably incorrect in that it illustrates 1 anal and 7 dorsal spines when there are 2 and 9 respectively.

STETHOJULIS AXILLARIS (Quoy and Gaimard).

Three specimens were collected from the pools at Tanegashima.

STETHOJULIS PHEKADOPLEURA Bleeker.

Tanegashima pools; 4 examples.

HALICHOERES POECILOPTERUS (Temminck and Schlegel).

Hakodate, Nagasaki, and Oki Island markets; Misaki pools and market.

HALICHOERES BLEKKERI (Steindachner and Döderlein).

Tokyo market.

HALICHOERES OPERCULARIS (Günther).

Tanegashima pools, 5 specimens. In life the body is silvery with a greenish cast, most of the scales edged with brick red or reddish brown, the color darker dorsally where it nearly covers the scales; lighter ventrally; much deeper in region of the dark spots; a pale golden stripe, bordered by greenish blue below eye; a greenish stripe on snout before eye. Dorsals variegated with red, the membrane tinged with golden; ring surrounding ocellus transparent below, orange above. Inner rays of caudal dotted with red; fin narrowly edged with red. Anal greenish yellow with red bands. Pectorals suffused with pink; ventrals deep red at base, broadly edged with dead white.

HALICHOERES TRIMACULATUS (Quoy and Gaimard).

Four specimens 50 millimeters and less in length, from Tanegashima, are believed to be the young of this species. Three of them have the characteristic axillary and caudal spots, the latter being absent on the smallest. In addition all have a black dot on lateral line at base of caudal, and 5 broad dusky bands on the body. Of the bands, the second and third tend to coalesce and the first and fourth are rather faint in one example.

THALASSOMA CUPIDO (Temminck and Schlegel).

Misaki; Tanegashima; Akune. Very abundant in the pools at Tanegashima.

In life the dark parts along the back and sides are bluish black, the connecting network brick red, the latter color bright and clear between the stripes, while becoming dark on approaching them. There is a brick red stripe along the lower half of body, the parts near it being bright green. The head and a restricted region below the pectoral tinted with brassy; stripe extending backward from mouth, pale red; chin, throat, breast, and belly tinged with bright red. The dorsal has a narrow transparent border below which is a stripe of brick red, then in succession one of yellowish green, reddish, and brownish black. Caudal green at base, then bluish tinged with red, then yellowish green followed by red. Anal with a basal stripe of reddish brown below which is a yellowish green stripe bordered by blue, then a red stripe and finally a pale greenish border. Pectorals lightly suffused with blue.

INIUSTIUS DEA (Temminck and Schlegel.).

Misaki and Shimizu markets.

The head is not entirely naked, there being a few small scales behind eye and at upper edge of opercle. A specimen from the

Tokyo market measuring about 150 millimeters in length has small dark spots, one on each scale, on the lower and posterior part of the body. The spots are elongate in shape and are arranged in straight lines.

Family SCARICHTHYIDÆ.

CALOTOMUS JAPONICUS (Cuvier and Valenciennes).

Tokyo and Misaki markets.

Family CHÆTODONTIDÆ.

CHÆTODON SETIFER Bloch.

Tanegashima pools. Two young examples, the first recorded from Japan.

CHÆTODON VAGABUNDUS Linnaeus.

Misaki and Tanegashima pools.

But three small specimens were secured.

CHÆTODON COLLARIS Bloch.

Kagashima market.

CHÆTODON NIPPON Doderlein.

Misaki, in the deep pools.

CHÆTODON LUNULA (Lacépède).

Aikawa, Misaki, Akune, and Tanegashima pools.

This species was reported as *Chaetodon modestus* by Jordan and Fowler,¹ an example of which they later describe as *Coradion desmotes*, new species.

Only the young of this species has been reported from Japan. Like many others it is apparently carried by currents to the northward far beyond a latitude where it is able to reach maturity. Young examples from Tanegashima were very light gray with a bluish tint, reddish orange posteriorly; dorsal, caudal, and anal edged with dead white; ventrals and pectorals pale blue.

CORADION MODESTUM (Schlegel).

Coradion desmotes JORDAN and FOWLER, Proc. U. S. Nat. Mus., vol. 25, 1903, p. 539—SMITH and POPE, Proc. U. S. Nat. Mus., vol. 31, 1907, p. 480.

Temminck and Schlegel's figure appears defective in not showing dark edges to the cross-bands. The caudal is nearly truncate, not lunate as in this figure nor rounded as represented by Jordan and Fowler.

Smith and Pope record a specimen from Urado. The fish dealers at Kagoshima recognizing the species from a figure, stated that it is occasionally found there.

MICROCANTHUS STRIGATUS (Cuvier and Valenciennes).

Misaki pools.

HOLACANTHUS BISHOPI Seale.

One specimen 17 millimeters long was found in a pool at Misaki. Adults were taken at Okinawa.

¹ Proc. U. S. Nat. Mus., vol. 25, 1903, p. 535.

Family HEPATIDÆ.

XESURUS SCALPRUM (Cuvier and Valenciennes).

Tokyo market; Misaki pools and market.

HEPATUS TRIOSTEGUS (Linnaeus).

Young examples from the pools at Tanegashima.

CTENOCHAETUS STRIATUS (Quoy and Gaimard).

This species is represented by a specimen 50 millimeters long from Misaki. This, among others, is a good example of a form carried to the northward by the warm currents, far beyond a point where it is able to maintain itself.

Family SIGANIDÆ.

SIGANUS FUSCESCENS (Houttuyn).

Tokyo market; Shimizu, taken with the seine.

Family TRIACANTHIDÆ.

TRIACANTHUS BREVIROSTRIS Temminck and Schlegel.

Numerous specimens of this species which appears to be rare in Japan were taken with a seine near shore at Shimizu. They measure about 105 millimeters.

Family BALISTIDÆ.

CANTHIDERMIS ROTUNDATUS (Percé).

Five specimens of this species were collected from the tide pools at Misaki. They measure from 55 to 128 millimeters in length. The larger ones are almost uniform blue black, the light spots being scarcely perceptible. It is possible that this species may only occasionally appear along the coast of Japan.

Family MONACANTHIDÆ.

MONACANTHUS CIRRHIFER Temminck and Schlegel.

Tokyo market; Misaki pools; Shimizu, seined in shallow water.

MONACANTHUS JAPONICUS Tilesius.

Kagoshima.

CANTHERINES MODESTUS (Günther).

Otaru, Hakodate, Nanao, and Tokyo markets.

RUDARIUS ERCODES Jordan and Fowler.

Misaki in shallow water.

ALUTERA MONOCEROS (Osbeck).

One small specimen was found in a pool at Misaki. D. 48; A. 49.

Family OSTRACIIDÆ.

OSTRACION IMMACULATUM Temminck and Schlegel.

Misaki.

OSTRACION DIAPHANUM Blech and Schneider.

Misaki.

One example has the sides of carapace parallel to about the base of pectoral, where they rather abruptly flare outward.

LACTOPHYTS TRITROPIS Snyder.

Plate 54, fig. 1.

Lactophrys tritropis SNYDER, Proc. U. S. Nat. Mus., vol. 40, 1912, p. 535.

Misaki pools.

Family TETRAODONTIDÆ.

SPHEROIDES SPADICEUS (Richardson).

Misaki; Shimizu; Kagoshima.

In life the specimen from Shimizu was light brown above with a golden tinge, the lower parts suffused with golden yellow; spots dark brown; iris orange red.

SPHEROIDES ALBOPLUMBEUS (Richardson).

Mororan, Hakodate, and Tokyo markets; Mori, with the seine; Otaru, Mororan; Aikawa, and Misaki pools.

This species, very like the above, may be distinguished by its generally larger and fewer spots, by the absence of minute white tubes above and below the lateral line, and by the large, dusky blotch on the caudal.

In some specimens of *S. alboplumbeus* the white spots are numerous enough and sufficiently close together to appear like ocelli; in some specimens the spots have a narrow dark border; while in other examples the spots join, forming light reticulations. Sometimes the latter tend to meet, thus inclosing round, dark spots, and causing the individual to resemble one of *S. pardalis*. Specimens of *S. pardalis* are easily distinguished by the presence of numerous small thickenings of the surface of the skin which look much like embedded scales. There appears to be some doubt concerning the validity of *S. borealis* Jordan and Snyder, it being possible that the species is founded on an extreme variation of *S. alboplumbeus*.

SPHEROIDES STICTONOTUS (Temminck and Schlegel).

Aikawa; Tokyo market.

Three specimens are closely spotted and finely reticulated above.

SPHEROIDES PARDALIS (Temminck and Schlegel).

Mororan and Tokyo markets; Aikawa, Misaki, and Shiogama pools.

SPHEROIDES EXASCURUS Jordan and Snyder.

One specimen from Misaki is in all particulars like the type of the species.

SPHEROIDES NIPHOBLIS Jordan and Snyder.

Aikawa; Misaki, Mitajiri, Kagoshima, and Tanegashima; both markets and pools.

The posterior part of the lateral line is bordered both above and below by a row of minute mucous pores that are rendered conspicuous because of their white openings. The caudal fin is mostly light in color, an occasional specimen having a slight touch of dusky near the border. In some young specimens the lateral blotches are continued across the back, forming a fairly well-defined saddle.

SPHEROIDES CHRYSOPS (Hilgendorf).

Misaki.

CANTHIGASTER RIVULATUS (Temminck and Schlegel).

Misaki market and pools.

CANTHIGASTER JACTATOR (Jenkins).

Misaki pools. Three specimens, measuring 37 millimeters in length, do not differ from Laysan Island examples. This species has not heretofore been taken except in the region of Hawaii.

Family **DIODONTIDÆ**.**DIODON HOLACANTHUS** Linnaeus.

Misaki. A specimen 260 millimeters long has comparatively short frontal spines and very long post-pectoral ones. It is spotted above and white beneath.

Family **SCORPAENIDÆ**.**SEBASTOLOBUS MACROCHIR** (Günther).

Shimizu market.

SEBASTODES TACZANOWSKII Steindachner.

Hakodate and Mororan markets. The species may be recognized among others from Japan by the white-tipped caudal. One specimen has 14 dorsal spines.

SEBASTODES ITINUS Jordan and Starks.

Hakodate market.

SEBASTODES STEINDACHNERI (Hilgendorf).

Otaru market.

SEBASTODES INERMIS (Cuvier and Valenciennes).

Otaru market; Misaki and Aikawa pools; Shiogama, seined.

Jordan and Starks are followed in the identification of *S. inermis* and *S. tokionis*. The first of these is deeper than the other, the depth being considerably greater than the length of head, and it has a smaller eye. These differences are especially striking when examples of the same size are compared. Either species might be identified with *S. inermis* as described by Cuvier and Valenciennes.¹

¹ Vol. 4, p. 346.

Günther¹ refers a specimen to *S. inermis*, remarking that the height of the body is equal to the length of the head, which would seem to indicate that he had an example of *S. tokionis*. Temminck and Schlegel describe and figure what appears to be one of these species (*S. ventricosus*). "L'oeil est très volumineux" and it is so illustrated in the figure which thus agrees with *S. tokionis*, but the depth measured on the figure is considerably greater than the length of the head, as in the form called *S. inermis* by Jordan and Starks. There seems to be no way to definitely determine which of these species is the *S. inermis* of Cuvier and Valenciennes, or whether either of them is. It appears probable that *S. inermis* Günther, *S. ventricosus* Temminck and Schlegel, and *S. tokionis* Jordan and Starks are synonymous.

Examples of the one here called *S. inermis* generally have 7 or 8 rays in the anal. Günther counts 6 rays in *S. inermis*. Temminck and Schlegel record 7 and figure 8 for *S. ventricosus*.

SEBASTODES TOKIONIS Jordan and Starks.

Tokyo market.

SEBASTODES JOYNERI (Günther).

Hakodate and Tokyo markets.

SEBASTODES IRACUNDUS Jordan and Starks.

A specimen measuring 340 millimeters from the market at Mororan is identified as *S. iracundus*. It agrees with the type of this species except in color and squamation, where some slight differences appear. The Mororan example is without the black spot which appears on the side of the body just below the spinous dorsal in the type. This spot is variable in size, however, as its diameter on one side of the single specimen is about equal to that of 5 scales, while on the other it is scarcely more than that of 1. The Mororan specimen has a broad, dark blotch on the upper part of the opercle, an indistinct, narrow, dusky border along the spinous dorsal, and a few indefinite, dusky clouds on the dorsal half of the body. These marks do not appear on the type, although the dark opercular spot is faintly indicated. Both specimens have the branchiostegal membranes blackish where they are covered with the opercles, and the lining of the gill chambers and the mouth also black, except the upper surface of the mouth and tongue. The squamation of the type is remarkably complete, minute scales covering the tip of the snout, maxillaries, mandibles, chin, throat, and branchiostegals rays. The Mororan specimen has naked spots in these regions, an occasional pit indicating that the scales may be deciduous in limited areas.

Sebastodes iracundus is closely related to *S. melanostomus* of the California coast, with which it may even be identical. Two

¹ Cat. Fish. Brit. Mus., pl. 2, p. 97.

examples of the latter, somewhat larger than the smaller Japanese specimen, have comparatively heavier and longer spines on the head, shorter dorsal spines, and slightly wider interorbital areas. These species are related to *S. introniger*, and a direct comparison of Japanese and California specimens does not contribute anything to an easy discrimination of either form.

SEBASTODES FUSCESCENS (Houttuyn).

Mororan, Hakodate, and Tokyo markets; Same, where taken in the pools.

SEBASTODES TANAKAE Snyder.

Plate 54, fig. 2.

Sebastes tanakae SNYDER, Proc. U. S. Nat. Mus., vol. 40, 1912, p. 536.

Market at Hakodate.

This species was named for Mr. Shigeo Tanaka.

SEBASTICHTHYS VULPES (Steindachner and Döderlein).

Hakodate.

SEBASTICHTHYS NIVOSUS (Hilgendorf).

Hakodate and Tokyo markets.

SEBASTICHTHYS TRIVITTATUS (Hilgendorf).

Otaru and Hakodate markets.

SEBASTICHTHYS MITSUKURII (Cramer).

Shiogama; Tokyo and Nanao markets.

SEBASTICHTHYS ELEGANS (Steindachner and Döderlein).

Tokyo and Misaki pools.

SEBASTICHTHYS PACHYCEPHALUS (Temminck and Schlegel).

Otaru, Hakodate, Aikawa, Misaki, Akune, and Tokyo; pools and market.

Small specimens from the pools at Aikawa and Misaki have 3 dense black bands crossing the body, one passing through dorsal fin and the other on the caudal peduncle. One specimen has no tympanic spine developed.

SEBASTISCUS MARMORATUS (Cuvier and Valenciennes).

Hakodate, Tokyo, Misaki, Nanao, Kagoshima, and Nagasaki markets.

One of the specimens from Nanao is rather light in color, has the spines rather more slender than the others, and in other respects resembles *S. albofasciatus*. It has no trace of a subocular spine.

HELICOLENUS HILGENDORFI Döderlein.

Shimizu market.

The writer is inclined to follow Döderlein¹ in regarding this species as distinct from *H. dactylopterus* (De La Roche). In comparing several Japanese specimens with others from the Atlantic, it is found that the former have a considerably larger eye and a narrower interorbital space, the median channel of which is also narrower.

¹ *Fische Japans*, vol. 4; 1884, p. 24.

SCORPÆNA FIMBRIATA Döderlein.

Tokyo market.

One specimen has 8 dorsal rays, not the usual 9 or 10.

SCORPÆNA ONARIA Jordan and Snyder.

Shimizu; young example seined near shore.

SCORPÆNA CIRRHOSA (Thunberg).

Two specimens of this species from Kagoshima are like adults in almost every detail except that the fins are longer and higher. The ventrals extend to the anal opening in one specimen, somewhat beyond in the other. The pectorals extend a little beyond the base of the third anal spine. The caudal, anal, and dorsal rays are slightly longer than those of adults. These specimens agree in most respects with the description of *S. kagoshimana* of Steindachner and Döderlein,¹ which is probably the young *S. cirrhosa*.

DENDROCHIRUS JORDANI (Regan).

Specimens of this species, associated with *Pterois lunulata* were taken with a seine along the sandy shores near Shimizu. They are beautifully banded with pale brown, each band having a narrow, dusky edge. There are 5 bands on the head, one near tip of snout, another from edge of eye to mouth, a third extending downward below pupil, a fourth crossing occiput and passing over middle of opercle, the last extending from occiput to upper part of opercle. The first band of body is broken above the shoulder, thus forming a saddle over the nape and a short band behind the pectoral. Five other bands occur on the body, the last being near the base of caudal. Dorsal, anal, and caudal with small, dusky spots. Ventrals and pectorals black, the latter with a few large, light spots on its upper edge. Maxillary with a long flap which extends to edge of preopercle. Specimens were from 36 to 90 millimeters long.

PTEROIS LUNULATA Temminck and Schlegel.

Misaki and Shimizu markets.

Small specimens seined near the beach at Shimizu have the pectoral filaments extending far beyond the tip of the caudal.

APISTUS EVOLANS Jordan and Sarks.

A specimen from Kagoshima almost exactly resembles the type of this species in color. It has 63 scales in the lateral series. Another from Nagasaki with a color pattern much like that of the type of *A. venenans* has 65 scales in the lateral series. These specimens appear to agree in all other respects with both *A. evolans* and *A. venenans*.

MINOUS ADAMSI Richardson.

Kagoshima and Nagasaki markets.

¹ *Fische Japans*, vol. 2, 1884, p. 28; vol. 4, 1887, pl. 2.

INIMICUS JAPONICUS (Cuvier and Valenciennes).

Nanao, Misaki, and Tokyo markets.

A series of specimens, mostly from the Tokyo market, ranging in color from bright orange to deep reddish brown seems to indicate that *I. japonicus* and *I. aurantiacus* are identical.

PARACENTROPOGON RUBRIPINNIS (Temminck and Schlegel).

Misaki and Shimizu pools.

Family **HEXAGRAMMIDÆ**.**AGRAMMUS AGRAMMUS** (Temminck and Schlegel).

Otaru, Hakodate, Same, Aikawa, Shiogama, and Tokyo markets.

Observed in pools from Otaru to Aikawa.

HEXAGRAMMUS OTAKII Jordan and Starks.

Plate 55, fig. 1.

Otaru, Hakodate, and Tokyo markets.

In an examination of a considerable number of specimens of this species, certain variations in the arrangement of the lateral lines of the breast and abdomen appear which serve to cast doubt on the validity of *H. aburaco* Jordan and Starks. The latter appears to have been distinguished from *H. otakii* in not having the fifth lateral lines connected with each other nor with the median line of the breast. This character is not constant. In one example from Aikawa the fifth line joins the median one posterior to the anal opening as usual, and then sends a branch forward and outward. In another the fifth line ends near the anal opening while its fellow of the opposite side joins the median line. A specimen from the Tokyo market has the lines arranged as in *otakii* on one side and as in *aburaco* on the other. Lesser variations sometimes occur, the median line being more or less irregular and broken, and the point of union between the median and fifth lines being near the anal opening or far forward near the base of ventrals. The color, fin rays, scales, etc., of a specimen from Hakodate, having the lateral lines of *H. aburaco* do not differ from those of typical *H. otakii*. This particular individual has a large, black spot on the posterior dorsal spines.

HEXAGRAMMUS OCTOGRAMMUS (Pallas).

Tide pools at Hakodate.

HEXAGRAMMUS LAGOCEPHALUS (Pallas).

One example from the market at Mororan.

Family **COTTIDÆ**.**RIKUZENIUS PINETORUM** Jordan and Starks.

Thirty specimens were collected in the pools at Hakodate. They resemble examples collected by the Bureau of Fisheries steamer *Albatross* at moderate depths near shore in all particulars except that they are darker in color. There are three ventral rays, large orbital tentacles, and a pair of cirri near the edge of the maxillary.

CERATOCOTTUS DICERAUS (Pallas).

Mororan and Hakodate markets; three specimens.

CERATOCOTTUS NAMİYÆ Jordan and Starks.

A male specimen from the Otaru market about 245 millimeters long (the type of the species measured the same) has 8 dorsal spines. The width of the interorbital space is contained five times in the head measured to end of opercular flap. The occipital ridges converge somewhat behind. There are many small prickles scattered along the back above the lateral line, in a region that is perfectly smooth in the type. The color pattern is like that of the type, except that the markings are everywhere distinct, the clouds, spots, and bars being deep brownish black. Both the Mororan example and the type have long, slender tentacles scattered over the lower half of the body behind the pectorals.

DSAYCOTTUS SETIGER Bean.

Otaru market.

COTTUS POLLUX Günther.

Yamaguchi.

Many specimens of *Cottus pollux* from Tachikawa collected by Jordan and Snyder have 1 spine and but 3 rays in the ventral fin. Others from Utsonomiya have similar ventrals. Specimens taken at Morioka have 4 rays. The examples from Morioka have 14 pectoral rays (except one which has 13), those from Tachikawa 13, and those from Utsonomiya 13 or 14. No other differences were found, and it is probable that they belong to the same species, the number of ventral rays being variable. *Cottus pollux* closely resembles the American *C. gulosus* and *C. punctulatus*, each of which occasionally produces individuals with 3 rays in the ventral fin.

COTTUS NOZAWÆ Snyder.

Plate 55, fig. 2.

Cottus nozawæ SNYDER, Proc. U. S. Nat. Mus., vol. 40, 1912, p. 537.

Ishikari R. at Sapporo, Hokkaido, Hakodate market.

Cottus nozawæ is distinguished from other Japanese species of the genus by the following combination of characters: Three preopercular spines, naked palatines, 4 ventral rays, and a very short maxillary which reaches to anterior border of eye and not beyond anterior border of pupil.

Cottus pollux has but 1 preopercular spine, the preopercle being smooth below this in specimens examined. The palatines are smooth, the maxillary long, reaching beyond the middle of pupil, or even well beyond the eye in large examples. The caudal peduncle is deeper than in *C. nozawæ*. *C. reinii*, which the writer has not seen, has 3 preopercular spines, thus differing from *C. pollux*, and a very long maxillary, which serves to distinguish it from *C. nozawæ*.

C. kazika has 4 preopercular spines, the upper one being especially large, prominent nasal spines, a very prickly skin, wide bands of palatine teeth, and long maxillary.

MYOXOCEPHALUS POLYACANTHOCEPHALUS (Pallas).

Otaru market.

MYOXOCEPHALUS EDOMIUS Jordan and Starks.

Mororan pools.

MYOXOCEPHALUS NIVOSUS (Herzensteini).

Mororan market.

MYOXOCEPHALUS RANINUS Jordan and Starks.

Hakodate market; Mororan, Same, and Aikawa pools.

MYOXOCEPHALUS YESOENSIS Snyder.

Plate 55, fig. 3.

Myoxocephalus yesoensis SNYDER, Proc. U. S. Nat. Mus., vol. 40, 1912, p. 538.

Hakodate market.

MYOXOCEPHALUS ENSIGER (Jordan and Starks.)

Several examples of the young of this species were collected in the pools at Hakodate by Jordan and Snyder and also by members of the Bureau of Fisheries steamer *Albatross* expedition. They measure about 80 millimeters in length. In life they were brilliant in color, like the coralline algæ, with three dark bands passing over the body; the first crosses the back beneath the spinous dorsal and passes downward and forward, enveloping the base of the pectoral fin; the second passes over the tail at the base of the soft dorsal, being nearly as broad as the fin is long, and extends downward to the anal; its lower anterior part is cut by a more or less definite large white spot; the third band covers the greater part of the caudal peduncle; its posterior edge has a deeply shaded concavity, which appears to be peculiar to the species. The color pattern here described is vaguely outlined in the type and cotypes. The young specimens have a smooth head, while only a trace of the strong occipital ridges and the elevated bony crest of the suborbital stay appear. The third preopercular spine is present in all.

GYMNOCANTHUS INTERMEDIUS (Temminck and Schlegel).

Hakodate pools; Hakodate market and pools.

In small examples the bony plates do not extend forward over the interorbital space.

GYMNOCANTHUS HERZENSTEINI Jordan and Starks.

Otaru markets and pools.

CROSSIAS ALLISI Jordan and Starks.

Hakodate, Same, and Aikawa pools.

COTTUSCULUS SCHMIDTI Jordan and Starks.

Mororan market; Hakodate pools.

Seven specimens measuring 80 to 100 millimeters in length were procured from the tide pools near Hakodate. They were all females,

and resemble the cotypes of the species which were dredged off Kinkozan by the Bureau of Fisheries steamer *Albatross*, except that they were very dark in color, the general pattern of coloration remaining the same. Other examples, very light in color, were obtained by the deep-water fishermen at Mororan.

ALCICETHYS ALCICORNIS (Herzenstein).

Hakodate market. Occasionally an example has one or both of the opercular spines bifid or trifid, the upper prong being longest.

FURCINA OSIMÆ Jordan and Stark.

Hakodate, Aikawa, and Misaki pools. A small patch of prickles is present behind the base of the pectoral.

FURCINA ISHIKAWÆ Jordan and Stark.

Aikawa pools.

OCYNECTES MASCHALIS Jordan and Stark.

Same and Misaki pools.

This species is recorded from Sakhalin by Tanaka,¹ but this identification is not without doubt as his specimen has 17 dorsal and 14 anal rays, while *O. maschalis* has 13 or 14 dorsal and 10 or 11 anal rays, many specimens not showing any variation from these numbers.

OCYNECTES MODESTUS Snyder.

Plate 56, fig. 1.

Ocynectes modestus SNYDER, Proc. U. S. Nat. Mus., vol. 40, 1912, p. 539.

Pools at Same.

O. maschalis has simple or bifid tentacles attached to the fleshy covering of the nasal spines. The posterior nostrils are tubular and located behind the nasal spines. The tentacles of the lateral line are similar to those of *O. modestus*.

PSEUDOBLENNIUS PERCOIDES Günther.

One example was secured in the market at Tokyo which has the small, blue spots on the side as figured by Temminck and Schlegel.² Many other examples had the blue underlaid with dusky, and the former disappearing in the preservative has left dark spots. Some of these are surrounded by lighter rings. In occasional examples the upper half of the body is finely speckled, there being in addition a mere trace of dusky bars. Usually the same region is more or less definitely barred, in rare instances the bars fusing and forming an almost solid brownish coat. In spite of this variation the color is quite distinctive, the lower parts being always spotted, the lateral line not having conspicuous blackish spots either elongate or grouped in twos or threes, and there being no coin-like silver spots on the sides. Ocelli are present on the upper and lower caudal rays. The snout is notably long and pointed, the maxillary extends well beyond the eye, the nasal tentacles are very small, the orbital tentacles are broad and fringed along one or both edges, and no nuchal or

¹ Annotations Zoologiques Japonaises, vol. 6, pt. 4, 1908, p. 246.

² Fauna Japonica pl. 79c, figs 2 and 3, labeled *Pseudoblennius*.

lateral line tentacles appear. The species appears to grow larger than the others, there being individuals 220 millimeters long in the collection.

PSEUDOBLENNIIUS JAPONICUS (Steindachner).

Misaki tide pools.

This species is apparently distinct from *Podabrus cottoides* Richardson.¹ The contour of the body is different, the caudal peduncle deeper, the spinous dorsal lower and also differing in shape, the outline of the fin being less evenly curved; the color of the fins also differs, the spinous dorsal being broadly edged with dusky and having a dark spot on the membrane between the second and third rays, the soft dorsal and anal with eight or more oblique rows of small spots on the rays, and the caudal with about four broad, vertical, dusky bars. Richardson does not mention nasal or supraorbital tentacles which are so conspicuous on the Japanese specimens. There are three or four slender, flat tentacles always present on the lateral line near the tip of the pectoral fin in *P. japonicus*.

The short maxillary, not usually extending beyond the pupil, the presence of tentacles on the lateral line, and also of broad, leaf-like nasal and supraorbital tentacles which are not conspicuously fringed, the series of brownish black spots, often in twos and threes along the lateral line, and the absence of large, round, silvery spots on the lower half of the body, form a combination of characters which will serve to distinguish this species among others of the genus known to occur in Japan.

Slender nuchal tentacles are usually present. The nasal spines protrude from the skin.

PSEUDOBLENNIIUS ARGENTEUS (Döderlein).

Hakodate, Aikawa, and Nanao markets and pools.

Individuals of this species are adorned in life with large, brilliant silvery spots on the sides. This may be known from other Japanese species by the long maxillary which usually extends beyond the orbit, unfringed nasal and suborbital tentacles, by the absence of tentacles on the nape and lateral line and by the conspicuous, silvery stripes on the sides. Solutions of formalin utterly destroy the silvery pigment (which is well preserved in alcohol), and then the species is apt to be confused with *P. percoides* and *P. japonicus*.

PSEUDOBLENNIIUS MARMORATUS (Döderlein).

Tokyo market; Misaki pools.

In this species the snouts of the males are conspicuously blunter than those of the females. In both sexes there is a small barbel near the posterior end of the maxillary, and there are usually a few minute, dermal flaps on the lateral line near the end of the pectoral.

¹ Voyage Samarang, Fishes, p. 13, pl. 1, figs. 1-6; not *Pseudoblennius cottoides* Jordan and Starks, Proc. U. S. Nat. Mus., vol. 27, 1904, p. 311, which is the present species.

BERO ELEGANS (Steindachner).

Aomori, Hakodate, and Same pools.

BERO ZANCLUS Snyder.

Plate 56, fig. 2.

Bero zanclus Snyder, Proc. U. S. Nat. Mus., vol. 40, 1912, p. 540.

VELLITOR CENTROPOMUS (Richardson).

Misaki pools; only eight specimens collected.

BLEPSIAS DRACISCUS Jordan and Starks.

Mororan; Hakodate; pools and markets.

HEMITRIPTERUS VILLOSUS (Pallas).

Mororan; Hakodate; Misaki.

Family **PLATYCEPHALIDÆ**.

THYSANOPHRYS SPINOSUS (Temminck and Schlegel).

Shimizu; 2 small specimens taken in shallow water with the seine.

THYSANOPHRYS MACROLEPIS (Bleeker).

Shimizu; seine.

THYSANOPHRYS MEERDERVOORTII (Bleeker).

Tokyo; Kagoshima and Shimizu markets; with seine at Shimizu.

THYSANOPHRYS JAPONICUS (Tilacius).

Tokyo, Misaki, and Kagoshima markets.

THYSANOPHRYS CROCODILUS (Tilacius).

Kagoshima markets.

PLATYCEPHALUS INDICUS (Linnaeus).

Tokyo and Kagoshima markets.

Family **TRIGLIDÆ**.

LEPIDOTRIGLA ALATA (Houttuyn).

Shimizu, Kagoshima, and Nagasaki markets.

LEPIDOTRIGLA STRAUCHI Steindachner.

Otaru, Same, Hakodate, Aikawa, Tokyo, and Tsuruga markets.

In an occasional specimen the black blotch of the dorsal is very faint or even entirely wanting.

LEPIDOTRIGLA ABYSSALIS Jordan and Starks.

Kagoshima market.

LEPIDOTRIGLA KISHINOUI Snyder.

Plate 56, fig. 3.

Lepidotrigla kishinouyei SNYDER, Proc. U. S. Nat. Mus., vol. 40, 1912, p. 543.

Kagoshima market.

LEPIDOTRIGLA GUNTHERI Hilgendorf.

Tokyo and Kagoshima markets; the specimen from Kagoshima measures 240 millimeters.

The pectoral bears a very definite color pattern on the inner side. The edge, sides, and base of the fin are immaculate. The remainder

is pale, bluish black, with a splash of dense blue black, broad near base of fin and rapidly narrowing outward to a tip near end of seventh ray, counting from above. In young examples the black region of the pectoral has a few elongate, pearly marks of very irregular shape.

LEPIDOTRIGLA JAPONICA (Bleeker).

Kagoshima and Nagasaki markets.

CHELIDONICHTHYS KUMU (Lessen and Garnot).

Tokyo, Misaki, Tsuruga, and Kagoshima markets. Specimens from the Tokyo market measure 380 millimeters in length.

Family CEPHALACANTHIDÆ.

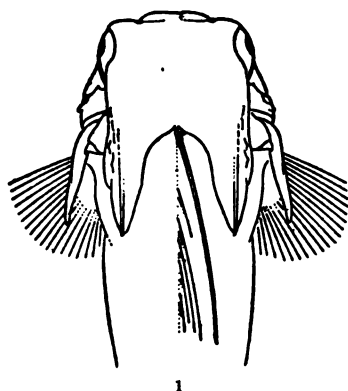
DACTYLOPTENA GILBERTI Snyder.

Plate 57, fig. 1.

Dactyloptena gilberti SNYDER, Proc. U. S. Nat. Mus., vol. 36, 1909, p. 804.

Kagoshima.

Dactyloptena jordani Franz appears to be identical with this species.



2

FIG. 1.—COMPARISON BETWEEN SNOUT, INTERORBITAL SPACE, AND IN ANGULATION OF REGION BETWEEN POSTTEMPORAL PROCESSES OF *DACTYLOPTENA GILBERTI* (1) AND *DACTYLOPTENA ORIENTALIS*.

Family AGONIDÆ.

TILESINA GIBBOSA Schmidt.

Many specimens that have been dredged in rather deep water were found in the market at Mororan. They appear to have the head somewhat more smooth than those described by Schmidt. The maxillary is also longer, reaching considerably beyond the middle of the snout.

AGONOMALUS PROBOSCIDALIS (Valenciennes).

One example from Otaru measures 105 millimeters in length. The dorsal has 10 spines, 6 rays; the pectoral 10 rays. The abdomen is devoid of spines, each lateral plate bearing a minute, rounded knob. The supraocular ridges are pronounced, thus making the interorbital area very concave. A larger specimen (155 millimeters long) was

secured in the market at Hokaido. The sides have an irregular, light cloud narrowly bordered with white extending from near the base of the pectoral to near the base of second dorsal. A band, similar in color, passes from the posterior half of the soft dorsal across the tail and the anal fin. The breast has white vermiculations on a dark brown ground.

AGONOMALUS JORDANI Schmidt.

Both males and females were secured among fishes dredged off shore by the Mororan fishermen. The males are small, measuring from 120 to 130 millimeters in length. The barbel is minute, the color lighter than that of the females, the lateral stripe broader and blacker, and the spots more distinct. Females measure from 130 to 170 millimeters. The male specimens from Mororan have a row of distinct, black spots along the plates below the lateral stripe, and a second row of spots below the latter, the lower row appearing only beneath the pectoral, and above the middle and posterior parts of the anal. In some examples the lateral band is much broader than in others and the lower row of spots varies somewhat and is occasionally absent. In 20 specimens the dorsal has from 7 to 9 spines, the usual number being 8. There are 7 or rarely 8 rays. The anal has 13 or 14 rays.

OCCA IBURIA Jordan and Starks.

Fourteen specimens were taken from a seine drawn by fishermen at Tomakomai, near Mororan. Six of these measure about 155 millimeters in length, while one is not over 35. The pectorals of the latter are dense black except for a broad terminal band of white, a narrow upper edge, and a spot at lower part of base of fin of same color. The caudal is black, narrowly edged above and below with white. The posterior halves of soft dorsal and anal are black.

BRACHYOPSIS ROSTRATUS (Tillemius).

Tomakomai and Mororan; seined near shore.

PALLASINA BARBATA (Steindachner).

Mori, Mororan, and Hakodate.

DRACISCUS SACHI Jordan and Snyder.

Podothecus tokubire Ishikawa.

Mororan; Hakodate.

A considerable number of specimens of this remarkable species were found among heaps of small fishes dredged off shore near Mororan by the native fishermen. One example about 45 millimeters long was found in a pool at Hakodate. In young individuals the dorsal and anal are not developed to the enormous length common in adults. After an individual reaches the length of about 200 millimeters the soft dorsal and anal increase rapidly in height (see appended table of measurements), the other fins, except the caudal,

not materially increasing their length in relation to the size of the body. Small examples resemble species of *Podothecus*, perhaps looking most like *P. xystes*.

Podothecus tokubire described by Doctor Ishikawa¹ is probably based on an injured example of *D. sachi* from Hokkaido, where dried specimens may occasionally be seen in the small shops.

Proportional measurements of 10 specimens of Draciscus sachi from Mororan.

[The spines on end of snout are not included in the length.]

	1	2	3	4	5	6	7	8	9	10
Length of body in millimeters.....	112	127	155	180	231	257	279	320	385	460
Length head.....	.30	.30	.29	.30	.30	.285	.29	.285	.26	.26
Depth body.....	.13	.125	.13	.135	.14	.13	.135	.135	.14	.145
Length snout.....	.15	.15	.15	.15	.15	.145	.15	.14	.135	.135
Diameter eye.....	.06	.06	.065	.065	.063	.06	.06	.06	.065	.06
Interorbital width.....	.07	.065	.07	.075	.065	.06	.06	.06	.065	.065
Snout to dorsal.....	.35	.35	.35	.35	.35	.34	.34	.34	.32	.31
Snout to ventral.....	.28	.28	.28	.29	.28	.26	.255	.26	.27	.25
Height dorsal spines.....	.12	.10	.11	.11	.12	.115	.125	.13	.135	.13
Height dorsal rays.....	.085	.10	.115	.115	.18	.24	.30	.365	.47	.47
Height anal.....	.08	.09	.10	.10	.18	.26	.28	.36	.45	.43
Length pectoral.....	.22	.20	.21	.22	.24	.23	.24	.22	.21	.20
Length ventral.....	.07	.07	.06	.07	.08	.085	.08	.085	.085	.08
Length caudal.....	.14	.13	.14	.15	.16	.16	.17	.15	.175	.155
Number of dorsal spines.....	8	8	9	9	8	9	9	8	8	8
Number of dorsal rays.....	13	13	14	13	14	13	13	14	13	14
Number of anal rays.....	16	16	16	17	16	17	17	16	16	16
Number of pectoral rays.....	17	16	16	17	17	17	17	18	18	17

PODOTHECUS THOMPSONI Jordan and Gilbert.

A single specimen from Mororan 90 millimeters long appears to belong to this species. When compared with cotypes from Iturup Island (60 millimeters long), the snout appears a little longer, the eye is slightly smaller, and the spines of the head and the ridges of the opercular region are somewhat higher and more spine-like. The dorsal has 9 spines, 6 rays, and the anal 6 rays.

PODOTHECUS XYSTES Snyder.

Plate 57, fig. 2.

Podothecus xystes SNYDER, Proc. U. S. Nat. Mus., vol. 40, 1912, p. 541.

Family CYCLOPTERIDÆ.

CYCLOPTERICHTHYS VENTRICOSUS (Pallas).

One specimen 330 millimeters long secured at Misaki. The species has not heretofore been reported south of Aomori. The Misaki specimen was obtained from Mr. Aoki and the date of its capture is unknown. This example was a female in which the oviducts were filled with eggs. By carefully weighing and counting, it was estimated that there were in all 44,619.

Individuals of this species may be found in pools, under rocks or attached to their sides. They swim very slowly and are perfectly helpless when removed from the water, inflating the body with air

¹ Jordan and Starks, Proc. U. S. Nat. Mus., vol. 27, 1904, p. 562.

until they are scarcely able to flop. The air is taken into the large, thin walled, distensible stomach and apparently retained by the constriction of the muscular walls of the cardiac end. There are 25 pyloric caeca. There is an enlarged, short rectum. No air bladder is present. The liver is large and consists of but a single lobe.

Family CYCLOGASTERIDÆ.

CYCLOGASTER AGASSIZII (Putnam).

Tomakomai, Hakodate, Same, and Aikawa, in pools and near shore.

Family PLEURONECTIDÆ.

SCÆOPS GRANDISQUAMA (Temminck and Schlegel).

Two small specimens were taken with the seine at Shimizu.

PSEUDORHOMBUS CINNAMOMEUS (Temminck and Schlegel).

Misaki and Shimizu markets.

It is the belief of the writer that this species and *P. misakius* Jordan and Starks are synonymous. The latter appears to differ from *P. cinnamomeus* as figured and described by Temminck and Schlegel, in having ocelli above and below the lateral line. These are much less prominent than the one located on the lateral line near the tip of the depressed pectoral, and they often grow less so with age, as is well illustrated by a small series of specimens. The white-bordered ocellus on the lateral line persists and it, together with the smooth scales of the blind side, serves to distinguish the species from *P. oligodon* (Bleeker), a specimen of which is referred to as *P. cinnamomeus* in the description of *P. misakius*.

PSEUDORHOMBUS OLIGODON (Bleeker).

Specimens were taken with the seine at Shimizu. They have 75 to 80 rays in the dorsal and 58 to 64 in the anal. The scales are ctenoid on both sides of the body, 82 to 86 lateral series; 76 to 80 pores in the lateral line. The gillrakers are comparatively heavy and short, the length being less than that of the filaments; 8 or 9 on the lower limb of the first arch. The eyes are large, the diameter of the upper being equal to the distance from edge of orbit to the tip of snout. The fins have many small, dark spots, and there is a brownish spot, varying in distinctness, located on the posterior part of the curve of the lateral line. Small specimens have rows of indistinct ocelli on the dorsal and ventral parts of the body. The specimens from Tsuruga mentioned by Jordan and Starks¹ are representatives of *P. oligodon* and they do not differ in any way from an example of the same species from Formosa.²

PSEUDORHOMBUS OCELLIFER Regan.

Shimizu.

¹ Proc. U. S. Nat. Mus., vol. 31, 1907, p. 174.

² Idem, p. 177.

PSEUDORHOMBUS ARSIUS (Buchanan Hamilton).

Specimens which appear to belong to this species were seined in shallow water at Shimizu and collected in the market at Kagoshima. They have smooth scales on the blind side, thus differing from *P. oligodon* which they resemble in general appearance. They also have larger scales and smaller eyes. They might be confused with *P. cinnamomeus* except for the lack of a white-bordered ocellus on the lateral line, fewer dorsal rays, and a somewhat more slender body. The largest specimen (from Kagoshima) measures 230 millimeters in length. There are 2 dark spots on the lateral line and traces of 2 rows of large ocelli above and below. Smaller examples from Shimizu are brighter in color, the ocelli being more distinct. The dorsal has from 72 to 75 rays; anal, 56 to 58; pores in lateral line, 75 to 77; scales in lateral series, 70 to 72.

PARALICHTHYS OLIVACEUS (Temminck and Schlegel).

Otaru, Tokyo, Shimizu, Nanao, and Kagoshima markets. Specimens from Tokyo have from 72 to 77 dorsal rays.

XYSTRIAS GRIGORJEWI (Herzenstein).

Hakodate market.

VERASPER VARIEGATUS (Temminck and Schlegel).

Tokyo market.

VERASPER MOSERI Jordan and Gilbert.

Tomakomai, with the seine; Mororan and Hakodate markets; Same, in the pools.

HIPPOGLOSSOIDES KATAKURÆ Snyder.

Plate 58, fig. 1.

Hippoglossoides katakuræ SNYDER, Proc. U. S. Nat. Mus., vol. 40, 1912, p. 546.

Otaru.

The dorsal rays number 80, not 90 as originally described.

HIPPOGLOSSOIDES DUBIUS (Schmidt).

Two specimens measuring 300 millimeters in length, from the Otaru market, are identified with this species, with some doubt as to whether the species itself really differs from *H. classodon*. These specimens differ from others presumed to represent *H. classodon* in having a more decided curve in the lateral line, somewhat smoother scales, a larger mouth, the maxillary extending to a point about midway between the pupil and posterior border of the eye, and a somewhat broader interorbital area, there being 2 rows of scales on its narrowest part. The Otaru specimens appear to have the anterior teeth in both jaws more decidedly enlarged. The dorsal rays number 82 or 83, anal 64 or 65; pores in lateral line 92 to 94; vertebrae 41; gillrakers 2-14. There are about 100 transverse series of scales.

PROTOPSETTA HERZENSTEINI (Schmidt).

Mororan; Otaru.

Small (190 millimeters long) specimens have much smaller, smoother, and less numerous plates on the head.

PLEURONICHTHYS CORNUTUS (Temminck and Schlegel).

Hakodate, Tokyo, and Tsuruga markets.

LEPIDOPSETTA MOCHIGAREI Snyder.

Plate 58, fig. 2.

Lepidopsetta mochigarei SNYDER, Proc. U. S. Nat. Mus., vol. 40, 1912, p. 547.

Otaru market.

LIMANDA IRIDORUM Jordan and Starks.

Otaru, Mororan, and Hakodate markets.

In life a band of bright orange extends along bases of dorsal, caudal, and anal on the blind side.

LIMANDA ANGUSTIROSTRIS Ktähara.

Otaru and Mororan markets.

LIMANDA YOKOHAMÆ (Günther).

Otaru, Mororan, and Nanao markets.

PLATICHTHYS STELLATUS (Pallas).

Otaru. Commonly seen in the markets as far south as Tokyo.

KAREIUS BICOLORATUS (Basilewsky).

Otaru, Nanao, Hakodate, and Mororan markets; small specimens seined near shore at Shimizu.

CLIDODERMA ASPERRIMUM (Temminck and Schlegel).

Otaru and Hakodate markets.

MICROSTOMUS STELLERI Schmidt.

Otaru, Mororan, and Hakodate markets.

GLYPTOCEPHALUS SASÆ Snyder.

Plate 59, fig. 1.

Glyptocephalus sasæ SNYDER, Proc. U. S. Nat. Mus., vol. 40, 1912, p. 548.

Otaru market.

A specimen of this species appears to have been seen by Doctor Jordan¹ in the museum at Hakodate.

Family SOLEIDÆ.

AMATE JAPONICA (Temminck and Schlegel).

Tokyo, Tanegashima, Kagoshima, and Nagasaki markets.

The pectoral fin forms part of a thin, raised rim which surrounds a part of the upper edge of the gill opening. Five short rays are distinctly visible.

ASERAGGODES KOBENSIS (Steindachner).

Small specimens were taken with the seine at Shimizu.

ZEBRIAS ZEBRINUS (Temminck and Schlegel).

Tokyo, Misaki, and Kagoshima markets.

ZEBRIAS JAPONICUS (Bleeker).

Hakodate market.

¹ Proc. U. S. Nat. Mus., vol. 31, 1907, p. 226.

ÆSOPIA CORNUTA Kaup.

Kagoshima markets.

RHINOPLAGUSIA JAPONICA (Temminck and Schlegel).

Tokyo, Misaki, Otaru, and Kagoshima markets.

ARELISCUS INTERRUPTUS (Günther).

Shimizu and Suruga markets.

This species is easily distinguished from *A. joyneri* by the close proximity of the eyes of the former.

ARELISCUS JOYNERI (Günther).

Kagoshima markets.

TRULLA ITINA Snyder.

Kagoshima, where numerous specimens measuring from 110 to 160 millimeters were taken. Some of them have the dark color more or less distinctly arranged in vertical bars. Scales in lateral line 80 to 86, counting from a point directly above gill opening; dorsal rays 105 to 108; anal rays 85 to 87.

Family GOBIIDÆ.

EVIOTA ABAX (Jordan and Snyder).

Misaki and Tanegashima pools; very abundant at the latter place.

HETERELEOTRIS ARENARIUS Snyder.

Tanegashima pools.

MOGURNA OBSCURA (Temminck and Schlegel).

Mitajiri; Yamaguchi; Takamatsu R., Akune.

When the lateral dusky bands are present they are narrow or pointed above, and broad and usually united below.

ELEOTRIS OXYCEPHALA (Temminck and Schlegel).

Tanegashima; one small specimen.

MAPO PŒCILICHTHYS (Jordan and Snyder).

Misaki, Akune, and Tanegashima pools.

The species was originally described from a brightly colored female. Male specimens are darker. The first dorsal ray has 5 black dots, and a row of 9 similar dots are on the upper edge of the soft dorsal, the zigzag markings of that fin so conspicuous in the female being almost obliterated by a general dusky color. The tongue is deeply notched. There are usually 34 scales in the lateral series.

But 2 examples were collected at Misaki, while at Akune and Tanegashima the species was numerously represented in the rock pools.

MAPO CRASSICEPS Jordan and Seale.

Twelve specimens of this species were collected at Tanegashima. One of them, presumably a male, is much darker than the others, the fins including the ventrals being blackish.

MAPO EOLOSOMUS (Ogilby).

This species is abundantly represented at Tanegashima, where it occurs in the more shallow, sandy pools.

MAPO FUSCUS (Rüppell).

Tanegashima; 13 specimens from the pools. The occiput is scaled, in some cases to the eyes, although a narrow, naked space may usually be found just behind the eyes. Sides with many narrow, indistinct, stripes, which serve to distinguish it from *M. poecilichthys* for which it might easily be mistaken.

GOBIUS ORNATUS Rüppell.

Three specimens were collected in the pools at Tanegashima.

AWAOUS GENIVITTATUS (Cuvier and Valenciennes).

One specimen was taken in the pools at Tanegashima where it appears to be rare.

CTENOGOBIUS SIMILIS (Gün.)

Aikawa; Yamaguchi.

CTENOGOBIUS GYMNAUCHEN (Bleeker).

Shimizu; Kagoshima; seined in shallow water.

CTENOGOBIUS HADROPTERUS Jordan and Snyder.

Takamatsu R., Akune; Shimonoseki; Tanegashima.

CTENOGOBIUS CAMPBELLI Jordan and Snyder.

Akune pools; two specimens.

CTENOGOBIUS VIRGATULUS Jordan and Snyder.

Shiogama.

ABOMA LACTIPES (Hilgendorf).

Tomakomai; Same, in Niigawa R.; Shiogama; Aikawa.

ABOMA SNYDERI Jordan and Fowler.

Fresh water ponds near Shiogama.

CRYPTOCENTRUS FILIFER (Cuvier and Valenciennes).

Shimizu, seine in shallow water; Tsuruga market.

ZONOGOBIOUS SEMIDOLIATUS (Cuvier and Valenciennes).

Tanegashima.

DORYPTENA TANEGASIMÆ Snyder.

Plate 59, fig. 2.

Doryptena tanegasimæ SNYDER, Proc. U. S. Nat. Mus., vol. 35, 1909, p. 104.

Tanegashima; Akune.

AMBLYGOBIUS NARAHARÆ Snyder.

One example found in a pool at Tanegashima.

ZONOGOBIOUS BOREUS Snyder.

Plate 59, fig. 3.

Zonogobius boreus SNYDER, Proc. U. S. Nat. Mus., vol. 36, 1909, p. 605.

Tide pools at Misaki.

CHÆNOGOBIUS MACROGNATHOS (Bleeker).

Tomakomai; Takamatsu R., Akune.

CHLOEA CASTANEA (O'Shaughnessy).

Nanao; Same; Aikawa; Shiogama; Dogo Island. Collected in the rice fields and small streams.

CHLOEA MORORANA Jordan and Snyder.

Mororan and Shiogama.

Large numbers of this species were secured with a small seine in the shallow water near shore at Mororan. The males are somewhat more slender than the females, and the fins are a little higher and longer. The dorsal surface is often much less reticulated than in the females and the branchiostegal membranes and the ventral, dorsal, and anal fins are dusky or even black in color.

CHASMICHTHEYS DOLICHOGNATHUS (Hilgendorf).

Hakodate; Same; Aikawa; Misaki; Shimonoseki; Mitajiri; Tanegashima; Akune pools.

This species appears to be more abundantly represented at Misaki than at any other point visited, where individuals fairly swarm in the shallow pools left near shore by the falling tide.

CHASMICHTHEYS GULOSUS (Guichenot).

Aikawa; Misaki; Shimonoseki; Mitajiri; Kagoshima; Akune; in pools.

This is the most common tide-pool species near Kagoshima.

PTEROGOBIOUS VIRGO (Temminck and Schlegel).

One large specimen was taken in a large rock pool at Misaki.

PTEROGOBIOUS ELAPOIDES (Günther).

Shiogama; Misaki pools.

What we now have reason to believe is the male sex of this species was described by Jordan and Snyder as *P. daimio*. Males are to be readily distinguished by their more robust bodies, brighter colors, the dark bands being blacker and almost twice as large as those of the females, and by generally having higher fins. Females are much paler in color, the bands are very narrow and there is an extra band or spot almost always present on the base of the caudal. A round spot is present in the same place on an occasional male. The writer has examined a large series of specimens of both sexes and no intergradation of characters has appeared.¹ In our collecting the sexes were not found together, and the male specimens taken far outnumber the females. The distinct color differences of the sexes, the fact that the two color phases were not found associated, and the poorly preserved specimens examined by Jordan and Snyder lead them to the conclusion that the males belonged to a distinct species.

¹ Bogan, *Annals and Magazine*, ser. 7, vol. 16, Jan., 1906, p. 22.

ACNATHOGOBIOUS FLAVIMANUS (Temminck and Schlegel).

Hakodate, Shiogama, Tokyo, Shimizu, and Dogo Island markets.

The species is very abundant in fresh and brackish waters.

CHÆTURICHTHYS SCHISTIUS Jordan and Snyder.

Hakodate and Kagoshima pools.

CHÆTURICHTHYS HEXANEMUS Bleeker.

Hakodate markets.

TRIDENTIGER OBSCURUS (Temminck and Schlegel).

Tomakomai; Same, in the Niigawa; Aikawa; Shiogama; Akune; Dogo Island.

TRIDENTIGER BUCCO Jordan and Snyder.

Shiogama pools.

TRIDENTIGER BIFASCIATUS Steindachner.

Shiogama; Shimonoseki.

Many specimens were collected at Shiogama in the pools.

ASTRABE LACTISELLA Jordan and Snyder.

Misaki and Tanegashima pools.

Four specimens closely resembling the type were taken at Misaki. A broad flap of loose, naked skin extends along the sides of the base of both dorsal and anal fins. One specimen only was taken at Tanegashima. It is somewhat more slender than those from Misaki and a little lighter in color. In life the spots on the head and fins were bright orange; those on body pale lemon yellow, except the one extending across base of pectoral which was white; dark areas, deep brown.

CLARIGER COSMURUS Jordan and Snyder.

Hakodate, Aikawa, and Misaki pools.

Thirty specimens were secured at Misaki. They agree closely with the type, except that in some individuals the lateral stripe is somewhat wider, and there are occasionally 11 rays in the dorsal and anal, the usual number being 12. A more careful examination of the teeth than was possible with the single type specimen shows that they are arranged in two series, an outer single row of stronger teeth which gradually increase in size posteriorly, and an inner broad band of weaker teeth, the posterior of which are larger than the others. In the upper jaw the posterior teeth of the upper band are almost as large as those of the outer row, while the others are very minute and weak. In the lower jaw of some specimens the most posterior tooth is somewhat larger than the others.

Individuals from Aikawa are somewhat lighter in color than the others.

CLARIGER EXILIS Snyder.

Plate 60, fig. 1.

Clariger exilis SNYDER, Proc. U. S. Nat. Mus., vol. 40, 1912, p. 544.

Ten specimens from Tanegashima range in size from 20 to 32 millimeters in length. They were found in the more outlying pools and appeared only after the water had been thoroughly poisoned.

The following measurements, made with all possible care, are recorded in hundredths of the length to base of caudal:

	1.	2.	3.
Length of body, mm.....	28	29	30
Length head.....	.25	.26	.26
Depth body.....	.125	.11	.12
Depth caudal peduncle.....	.115	.11	.115
Length caudal peduncle.....	.18	.17	.19
Length snout.....	.065	.06	.06
Diameter eye.....	.045	.05	.045
Interorbital width.....	.06	.05	.05
Depth head.....	.12	.11	.105
Snout to spinous dorsal.....	.46	.46	.48
Length base of soft dorsal.....	.20	.22	.21
Length base of anal.....	.20	.22	.215
Height soft dorsal.....	.075	.06	.07
Height anal.....	.075	.06	.07
Length pectoral.....	.18	.15	.17
Length ventral.....	.11	.09	.10
Length caudal.....	.21	.16	.20

AINOSUS GENEIONEMUS (Hilgendorf).

One specimen from the pools at Misaki. The tongue is forked and there are about 4 rows of embedded scales on the cheek below the eye.

INU KOMA Snyder.

Plate 60, fig. 2.

Inu koma SNYDER, Proc. U. S. Nat. Mus., vol. 36, 1909, p. 607.

Misaki pools.

INU AMA Snyder.

Plate 60, fig. 3.

Inu ama SNYDER, Proc. U. S. Nat. Mus., vol. 36, 1909, p. 608.

Misaki pools.

LUCIOGOBIUS GUTTATUS GIL.

Mororan, Hakodate, Same, Aikawa, Misaki, Shimonoseki, Akune, and Tanegashima pools.

LUCIOGOBIUS ELONGATUS Regan.

Tanegashima pools.

Nine specimens were collected. The ventrals are minute, but not at all scale-like as described, there being 4 rays distinctly visible under the lens.

EXPEDIO PARVULUS Snyder.

Plate 61, fig. 1.

Expedio parvulus SNYDER, Proc. U. S. Nat. Mus., vol. 36, 1907, p. 606.

Pools at Misaki.

Family **PTEROPSARIDÆ**.

PARAPERCIS PULCHELLA (Temminck and Schlegel).

Seined near shore at Shimizu.

NEOPERCIS SEIFASCIATA (Temminck and Schlegel).

Tokyo and Kagoshima markets; Shimizu, seined.

Family **TRICHODONTIDÆ**.

ARCTOSCOPIUS JAPONICUS (Steindachner).

Otaru, Mororan, and Hakodate markets.

Family URANOSCOPIDÆ.

URANOSCOPIUS JAPONICUS Houttuyn.

Tokyo market; Shimizu, seined near shore.

URANOSCOPIUS BICINCTUS Temminck and Schlegel.

Shimizu, where specimens were collected with the seine.

GNATHAGNUS ELONGATUS (Temminck and Schlegel).

One specimen from the market at Kagoshima.

Family CALLIONYMIDÆ.

CALLIORICHTHYS DORYSSUS Jordan and Fowler.

Hakodate market; Shimizu, in shallow water near shore.

CALLIORICHTHYS JAPONICUS (Houttuyn).

Shimizu; taken with the seine.

CALLIONYMUS LUNATUS Temminck and Schlegel.

A pale colored specimen from Nagasaki closely resembles that figured by Temminck and Schlegel. The first dorsal spine though broken reaches past the middle of the soft dorsal, the spines following it being somewhat shorter than the anterior dorsal rays. The posterior dorsal rays are elongate, reaching the base of caudal; the last anal rays are similar. There is a black, lunate spot on the posterior edge of the spinous dorsal and a diffuse, dark band on the lower part of the caudal; the anal is dusky along its median portion; the soft dorsal has a few elongate, dusky spots, and similar ones appear on the upper part of the caudal. An examination of a series of specimens shows some variation in both structure and color. The height of all the fins is often much reduced, the filament of the first dorsal spine being very short and the last rays of the dorsal and anal not reaching the base of the caudal; the fourth and third dorsal spines are sometimes successively shortened. The color is often intense, the black spot spreading over a considerable part of the spinous dorsal and becoming more or less broken up in an occasional specimen; the dusky region of the anal becoming restricted in area and intense in color, the edge of the fin at the same time growing white, the dusky, lower portion of the caudal becoming modified in a similar way, so that the black band of the anal appears to be continued on the caudal; the dusky spots of both soft dorsal and upper part of caudal growing more elongate, narrow and distinct. The specimen figured by Jordan and Fowler¹ is a brightly colored example with short fins. Mr. Regan's² opinion that this specimen represents *C. inframundus* Gill,³ and that it is not Temminck and Schlegel's species does not

¹ Proc. U. S. Nat. Mus., vol. 25, 1903, p. 940, fig. 5.

² Ann. and Mag. Nat. Hist., vol. 15, p. 24.

³ Proc. Acad. Nat. Sci. Phila., vol. 11, p. 129.

appear to be well founded. Of the color Doctor Gill says: "Light brownish, marbled with white, and with a blackish first dorsal."

The species may be easily recognized by the more or less definite dark bar extending along the lower half of the caudal.

CALLIONYMUS VALENCIENNESI Temminck and Schlegel.

Tokyo, Shimizu, Kagoshima, and Nagasaki markets.

CALLIONYMUS BENITEGURI Jordan and Snyder.

Otaru, Hakodate, and Misaki markets.

Some variation in the structure of the preopercular spine has been observed. There are generally 3 recurved hooks present, but occasional specimens have but 2, a third being sometimes indicated by a sharp elevation, while rarely an example may be found with but 1. All individuals examined have a comparatively wide inter-orbital space, the back covered with numerous ocelli, the anal in the male with white, wavy lines, in the female dusky or immaculate, the caudal with elongate, blackish spots except on the three lower membranes, soft dorsal with ocelli, vermiculations, and at least 1 (median) row of blackish spots.

CALLIONYMUS FLAGRIS Jordan and Fowler.

Hakodate and Shimizu markets.

DRACULO MIRABILIS Snyder.

Plate 61, fig. 2.

Draculo mirabilis SNYDER, Proc. U. S. Nat. Mus., vol. 40, 1912, p. 545.

Tomakomai in Hokkaido.

Family GOBIESOCIDÆ.

ASPASMA MINIMA (Döderlein).

Misaki pools.

ASPASMA MISAKIA Tanaka.

Misaki and Tanegashima pools. This appears to be a rather widely distributed species, being found at least as far south as Okinawa, where specimens were more frequently taken than at Misaki.

Family BLENNIIDÆ.

ENNEAPTERYGIUS TUSITALE Jordan and Seale.

Pools at Tanegashima.

ENNEAPTERYGIUS ETHEOSTOMA (Jordan and Snyder).

This species appears to be equally abundant at Misaki and Tanegashima where it occurs in the tide pools.

ENNEAPTERYGIUS BAPTURUS (Jordan and Snyder).

Misaki pools. One small specimen of this rare species was found.

ZACALES BRYOPE Jordan and Snyder.

Misaki and Aikawa pools. One example at Aikawa.

Some examples possess scarcely a trace of the bright color pattern so commonly found, the whole body and fins being almost uniform.

The species is abundantly represented at Misaki but appears to be rare toward the northward.

ALTICUS ELLIPES (Jordan and Starks).

Tanegashima pools.

ALTICUS MARGARITARIUS Snyder.

Plate 61, fig. 3.

Alticus margaritarius SNYDER, Proc. U. S. Nat. Mus., vol. 35, 1909, p. 106.

Pools at Tanegashima.

PETROSCIRTES LOXOZONUS Jordan and Starks.

Tanegashima pools.

PETROSCIRTES ELEGANS Steindachner.

Aikawa, Misaki, Shiminoseki, Mitajiri, and Akune pools, the latter locality being the most southern record.

SALARIAS LINEATUS Bleeker.

Tanegashima pools.

SALARIAS ANDERSONI Jordan and Starks.

Tanegashima pools.

SALARIAS QUADRICORNIS Cuvier and Valenciennes.

Misaki, Akune, and Tanegashima pools.

SALARIAS TANEGASASIMÆ Jordan and Starks.

Tanegashima pools, where the species is abundantly represented. The males are dark in color, the females having many oblique, black lines with light spaces between. This species is easily distinguished from *S. quadricornis* by the long, fringed orbital tentacles, those of *S. quadricornis* being shorter and without fringed edges. An occipital crest is present in *S. tanegasasimæ*, prominent in the males and very small or absent in the females.

AZUMA EMNION Jordan and Snyder.

Hakodate pools. The figure illustrating this species is incorrect in that the origin of the dorsal should be represented as halfway between occiput and upper edge of gill opening.

BRYOSTEMMA POLYACTOCEPHALUM (Pallas).

Hakodate, Same, and Aikawa pools.

ENEDRIAS NEBULOSUS (Temminck and Schlegel).

Mororan, Hakodate, Same, and Shiogama pools. One of the most abundant tide pool fishes at Same.

CRISTICEPS FLAMMEUS Jordan and Starks.

Tanegashima pools.

PHOLIS TACZANOWSKII (Steindachner).

Hakodate and Same pools. In life the color ranges from the olive brown to the bright red, green and lilac of the algæ, a silver stripe below the eye and a row of spots on the sides standing out in bold and brilliant contrast.

ALECTRIAS BENJAMINI Jordan and Snyder.

Pools at Mororan, Hakodate, and Aikawa.

NEOZOARCES STEINDACHNERI Jordan and Snyder.

Hakodate and Same pools.

ZOARCHIAS VENEVICUS Jordan and Snyder.

Hakodate pools.

DICTYOSOMA BURGERI Van der Hoeven.

Hakodate, Same, Aikawa, and Akune pools. This was the most common tide pool fish at Aikawa while only 5 specimens were found at Same.

OPISTHOCESTRUS OCELLATUS (Tilley).

Mororan, Hakodate, Same, and Aikawa pools.

OPISTHOCESTRUS ZONOPE Jordan and Snyder.

Mororan pools.

ABRYOIS AZUMÆ Jordan and Snyder.

Pools of Mororan. The species has not yet been seen elsewhere. The young of an inch or so in length have a bright, silvery stripe extending from lower edge of eye through base of pectoral to insertion of anal. The tail has a light border and the spot on the dorsal is indistinct. The head varies from 6.6 in the length in large examples to 5 in the smaller ones.

ERNOGRAMMUS HEXAGRAMMUS (Temminck and Schlegel).

Pools at Hakodate, Same, and Aikawa. Young examples have the dorsal fin considerably elevated posteriorly.

ERNOGRAMMUS EPALLAX Jordan and Snyder.

A single specimen of this species was secured in a deep pool at Hakodate. It agrees with the original description of the species, the dorsal and anal having the same number of spines. The head below the eye is marked with a number of very distinct, white spots. The ventral part of the body has similar spots which are much less distinct in outline. The specimen measures 170 millimeters in length.

OZORTHES DICTYGRAMMA (Herzenstein).

Hakodate and Same pools.

DINOGRUNNELLUS GRIGORJEWI (Herzenstein).

Mororan; in the tide pools.

LUMPENUS ANGUILLARIS (Pallas).

Mororan and Hakodate. Two poorly preserved specimens of this species were found, one in the stomach of an example of *Hemipterus villosus* from Mororan, the other on the beach at Hakodate.

Family **AMMODYTIDÆ**.

AMMODYTES PERSONATUS Girard.

Mororan and Hakodate markets; Same, collected with the seine.

Family BROTULIDÆ.

HOPLOBROTULA ARMATA (Temminck and Schlegel).

Kagoshima market.

SIREMBO IMBERBIS (Temminck and Schlegel).

Nagasaki market.

Family GADIDÆ.

GADUS MACROCEPHALUS Tilesius.

Otaru markets.

ELEGINUS NAVAGA (Körreuter).

Otaru market.

PHYSICULUS JAPONICUS Hilgendorf.

Hakodate market.

LOTELLA PHYCIS Temminck and Schlegel.

Hakodate and Aikawa markets.

Family LOPHIIDÆ.

LOPHIUS LITULON (Jordan).

Otaru; Hakodate; in the markets.

Family ANTENNARIIDÆ.

PTEROPHYRNE HISTRIO (Linnaeus).

A large specimen from Mororan has an immaculate ventral surface and filaments on the sides. It is doubtful if *P. ranina* should be recognized as a distinct species.

ANTENNARIUS TRIDENS (Temminck and Schlegel).

Misaki pools; Shimizu, taken with the seine.

1. LEPTOCEPHALUS FLAVIROSTRIS. (PAGE 405.) FROM THE TYPE.

2. GYMNOTHORAX ODIOSUS. (PAGE 407.) FROM THE TYPE.



3. SYNGATHUS YOSHI. (PAGE 407.) FROM THE TYPE.



1. *CORYTHOICHTHYS QUINQUARIUS*. (PAGE 408.) FROM THE TYPE.

2. *JORDANIDIA RAPTORIA*. (PAGE 410.) FROM THE TYPE.

3. *CATALUFA UMBRA*. (PAGE 412.) FROM THE TYPE.

1. PSEUDANTHIAS VENATOR. (PAGE 414.) FROM THE TYPE.

2. ABUDEFDUF CLARKI. (PAGE 419.) FROM THE TYPE.

1. LACTOPHRYS TRITROPIS. (PAGE 424.) FROM THE TYPE.

2. SEBASTODES TANAKÆ. (PAGE 427.) FROM THE TYPE.

1. *HEXAGRAMMUS OTAKII*. (PAGE 429.)

2. *COTTUS NOZAWÆ*. (PAGE 430.) FROM THE CO-TYPE.

3. *MYOXOCEPHALUS YESOENSIS*. (PAGE 431.) FROM THE TYPE.

1. OCYNECTES MODESTUS. (PAGE 432.) FROM THE TYPE.

2. BERO ZANCLUS. (PAGE 434.) FROM THE TYPE.

3. LEPIDOTRIGLA KISHINOUI. (PAGE 434.) FROM THE TYPE.

1. DACTYLOPTENA GILBERTI. (PAGE 435.) FROM THE TYPE.

2. PODOTHECUS XYZTES. (PAGE 437.) FROM THE TYPE.

1. HIPPOGLOSSOIDES KATAKURÆ. (PAGE 439.) FROM THE TYPE.

2. LEPIDOPSETTA MOCHIGAREI. (PAGE 440.) FROM THE TYPE.



1. HIPPOGLOSSOIDES KATAKURÆ. (PAGE 439.) FROM THE TYPE



1. GLYPTOCEPHALUS SASÆ. (PAGE 440.) FROM THE TYPE.

2. DORYPTENA TANEGASIMÆ. (PAGE 442.) FROM THE TYPE.

3. ZONOGOBIUS BOREUS. (PAGE 442.) FROM THE TYPE.

1/8 in

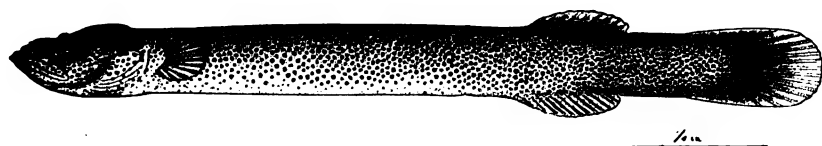
1. CLARIGER EXILIS. (PAGE 444.)

1/8 in

2. INU KOMA. (PAGE 445.) FROM THE TYPE.

1/8 in

3. INU AMA. (PAGE 445.) FROM THE TYPE.



1. EXPEDIO PARVULUS. (PAGE 445.) FROM THE TYPE.



2. DRACULO MIRABILIS. (PAGE 447.)



3. ALTICUS MARGARITARIUS. (PAGE 448.) FROM THE TYPE.

NOTES ON AFRICAN ORTHOPTERA OF THE FAMILIES
MANTIDÆ AND PHASMIDÆ IN THE UNITED STATES
NATIONAL MUSEUM, WITH DESCRIPTIONS OF NEW
SPECIES.

By JAMES A. G. REHN,

Of the Academy of Natural Sciences of Philadelphia.

The following paper is based on a portion of a series of African Orthoptera turned over to me for study several years ago by the late Dr. W. H. Ashmead, assistant curator of insects in the United States National Museum. My delay in bringing out this report has not been without its advantages, as the Berlin Museum recently placed in my hands for study its entire unworked series of material of the present families from central Africa, thus enabling me to secure a much more satisfactory knowledge of the subject.

At a later date it is my intent to bring together all the records which I have published relating to the series from Liberia and Luebo, Kongo, regions of the greatest interest faunistically, but for the present it seems best to make this report cover all the African material in the United States National Museum collection belonging to the two groups here considered.

For the opportunity to study this collection my thanks are due the authorities of the National Museum.

Family MANTIDÆ.

Subfamily ORTHODERINÆ.

Genus THEOPOMPA Stål.

THEOPOMPA NEBULOSA Bellvar.

1908. *Theopompa nebulosa* BOLIVAR, Mem. R. Soc. Españ. Hist. Nat., vol. 1, p. 458, pl. 11, fig. 2. [Kamerun.]

Luebo, Kongo. (D. W. Snyder.) One female.

This specimen fully agrees with the original description except for the subconfluent character of the two proximal blackish maculations on the internal face of the cephalic femora, the sulcus alone dividing them.

The range of the species is considerably extended by this record.

Genus TARACHODES Burmeister.

TARACHODES WERNERI, new name.

1907. *Tarachodes perloides* WERNER, Sitzungsab. k. Akad. Wiss. Wien, Math.-nat. Kl., vol. 116, Abth. 1, pp. 192, 208, pl. 3, figs. 1-2. [Southwest Africa.] (Not of Burmeister, 1838.)

Loanda, Angola. One male.

It is evident on comparing the original description of *Tarachodes perloides* Burmeister¹ with Werner's key for the species of the genus and notes on *perloides* as recognized by him, that the latter is in error in the association of his specimens. Burmeister states distinctly, "ventre rufescente, segmentis 2-punctatis," while Werner in his key gives as one of the diagnostic characters of *perloides* "abdomen subtus immaculatum." It is quite probable that true *perloides* is the same as either *sancta* Saussure or *maura* Stål, both of which have the abdominal segments bimaculate ventrad. With the material available at the present time we can not say which of these names should be replaced by the older *perloides*. Under any circumstance *perloides* of Werner is not *perloides* of Burmeister, and a new name is required for the former. I take pleasure in dedicating the species to the author of the very valuable paper in which its characters were described and the species figured.

TARACHODES DIVES (Saussure).

1869. *Ch[iropus] dives* SAUSSURE, Mitth. Schw. Ent. Ges., vol. 3, p. 61. [Benguella.]

Loanda, Angola. (H. Chatelain.) One female.

Mossamedes district, Angola. One female nymph. [Acad. Nat. Sci. Phila.].

From this material it is apparent that Werner² was mistaken in referring the female specimen of this species from Benguella described by Saussure³ to *T. perloides* Burmeister as recognized by him.⁴ The specimens before me fully agree with Saussure's original description and figure and differ from Werner's figure in the more elongate pronotum, which is slightly constricted caudad. The cephalic margin of the pronotum is also more arcuate, the lateral angles less decided, and the caudal margin more decidedly truncate mesad. The width of the head in proportion to that of the pronotum is considerably greater in the female of *dives* than in Werner's figure of the same sex of *perloides* (= *wernerii*).

¹ Handb. d. Entom., vol. 2, Abth. 2, pt. 1, p. 529. [Cape of Good Hope.]

² Sitzungsab. k. Akad. Wiss. Wien., Math.-nat. Kl., vol. 116, 1907, Abth. 1, pp. 202 and 210.

³ Mélanges Orthoptérologiques, vol. 3, 1870, p. 164, pl. 4, figs. 1, 1a.

⁴ See *T. wernerii*, p. 452.

TARACHODES PILOSIPES, new species.

Type.—Male; Luebo, Kongo. (D. W. Snyder.) [Cat. No. 14602, U.S.N.M.]

Closely allied to *T. dissimulator* Wood-Mason¹ from Kamerun, agreeing in general proportions and form, in the pale proximal area on the tegmina and in the pilosity of certain portions of the body, but differing in the arcuate instead of truncate vertex, in the nondenticulate cephalic coxæ, in the almost complete absence of black from the internal faces of the cephalic coxæ and femora, in the absence of blackish puncta caudad on the prosternum and also of a distinct maculation on the metasternum and in the less clearly defined proximal and completely absent distal pale areas on the tegmina.

Size rather large; form subdeuteral surface pilose, this strongly on the caudal limbs. Head with greatest width about one and one-fifth times the greatest width; face slightly concave; clypeus distinctly arcuate, the juxtaocular sulci well impressed; ocelli moderately large, placed in a triangle; facial shield with the greatest depth contained one and two-thirds times in the greatest width, dorsal margin subtruncate mesad, slightly oblique subtruncate laterad, lateral margins subparallel, ventral margin slightly arcuato-emarginate, surface of shield smooth; antennæ simple; eyes not projecting, their outline rounding into that of the head. Pronotum with the greatest dorsal (supra-coxal) width contained slightly less than twice in the length, the width at the cephalo-lateral angles very slightly less than that of the supra-coxal region, that at the caudo-lateral angles not more than four-fifths that of the widest portion; cephalic margin strongly arcuate, slightly sinuate laterad, with a slight median truncation, cephalo-lateral angles distinctly produced, angulate, lateral margins slightly pilose, bi-undulate, narrower caudad of the coxal insertion than cephalad of the same, caudo-lateral angles rounded, caudal margin rather broadly truncate mesad, obliquely truncate laterad; surface of disk multimpresed, a more or less distinct medio-

FIG. 1.—TARACHODES PILOSIPES. DORSAL VIEW OF TYPE. (X 14.)

¹ Journ. Asiatic Soc. Bengal, vol. 51, pt. 2, p. 23.

longitudinal shallow sulcus present, a well-marked transverse sulcus present at the cephalic third and subobsolete mesad, caudal third with a \cap -shaped area depressed below the level of the median section, a shallow transverse depression is present at the cephalic sixth, oblique paired depressions located meso-laterad and a transverse narrow rounded elevation borders the caudal margin. Tegmina decidedly exceeding the apex of the abdomen, the length slightly greater than three times that of the pronotum, broad, the greatest width contained about three and one-half times in the length of the same, hyaline; costal margin well arcuate proximad and distad, straight for the remainder of its length; sutural margin for the greater portion of its length subparallel to the straight section of the costal margin; apical margin oblique arcuato-truncate, the immediate apex costal in position and well rounded. Wings about five-sixths the length of the

tegmina, the greatest width contained about twice in the length, apex rotundato-rectangulate. Supra-anal plate transverse subtrigonal, the apex rather deeply rotundato-emarginate; cerci distinctly surpassing the apex of the subgenital plate, depressed, slightly tapering, moniliform; subgenital plate very ample, lateral margins moderately converging caudad, apical margin truncate, styles short, simple, free. Cephalic coxæ two-thirds the length of the pronotum, robust, unarmed; cephalic femora hardly shorter than the pronotum, compressed, the dorsal portion strongly so, the greatest depth of the femur contained

FIG. 2.—*TARACHODES PILOSIPES*. VENTRAL VIEW OF HEAD, STERNA AND CEPHALIC LIMB. (X 14.)

two and one-third times in the length of the same, dorsal margin slightly arcuate proximad, straight distad, external face broad, deplanate, with a median raised distal ridge, ventro-external margin with five short teeth, one of which is on the genicular lobe, ventro-internal margin with twelve to thirteen small teeth of two, usually alternating, sizes, discoidal spines four in number, placed well proximad and with the proximal one very small, the others short and robust; cephalic tibiae (exclusive of apical claw) equal to slightly more than two-thirds of the femoral length, armed on the external margin with thirteen to fifteen spines, on the internal margin with fourteen spines, both series with the spines gradually increasing in length distad; cephalic tarsi subequal to the tibiae in length, compressed, the metatarsi sublamellate disto-dorsad. Median and caudal limbs rather short, the former very robust with the femora greatly compressed, the caudal femora equal to about three-fourths of the pronotal length and the median pair slightly shorter than the caudal ones.

General color buff, much of the dorsum of the pronotum washed with vinaceous-buff; the dorsal surface of head, pronotum, external face

of the caudal limbs and most of the median and caudal limbs more or less thickly and distinctly punctulate with vandyke brown. Tegmina hyaline, proximal portion subopaque cream-buff, obliquely delimited, embracing the concolorous stigma and all of the marginal field; veins cream-buff, the longitudinal ones with regularly placed sections of brown, varying from vandyke to seal brown, which at the intersections of cross-veins color the latter to or nearly as far as the spurious veins, the latter seal brown. Wings milky hyaline, slightly buffy along the costal margin, principal veins cream-buff, the principal veins of the discoidal field marked as on the tegmina, but in a weaker, more irregular fashion. Cephalic coxæ pale rose purple on the internal face, proximal extremity narrowly dark brown, the distal margin of the general color, preceded by a small brownish spot; cephalic femora weakly lined with brownish on the median keel of the internal face. Tarsi with the joints tipped with dark brown, the metasterni with three to four maculations of the same. Prosternum solidly blackish except for a short caudal unmarked section of the general color; mesosternum and metasternum non-maculate.

Measurements.

	mm.
Length of body.....	37.0
Length of pronotum.....	9.8
Greatest width of pronotum.....	5.5
Length of tegmen.....	31.0
Greatest width of tegmen.....	9.2
Length of cephalic femur.....	9.0

The type of this beautiful species is unique.

Genus *GALEPSUS* Stål.

GALEPSUS CONGICUS, new species.

Type.—Male, Luebo, Kongo. (D. W. Snyder.) [Cat. No. 14603, U.S.N.M.]

Allied to *G. lenticularis* (Saussure), *G. capitatus* (Saussure), and *G. meridionalis* form *intermedius* Werner from South and East Africa, but differing from both the latter in the distinctly narrower and proportionately much deeper head, in the somewhat more arcuate vertex and more rounded eyes. From *G. lenticularis*, which is apparently its closest ally, it can be separated by the absence of distinct protuberances on the vertex and by the less arcuate character of the same. The form of the head in this species is quite distinctive, being distinctly narrower than deep.

Size rather small; form slender and elongate, slightly depressed; surface smooth. Head slightly but distinctly deeper than wide, as is usual in the genus, flexed so that its axis is horizontal, the exposed dorsal portion of the occiput gently rounded with a pair of impressed

juxta-ocular arcuate sulci paralleling the eyes; occipital line undulate arcuato-truncate between the sulci, subarcuate laterad; ocelli placed in a triangle, the ventral ocellus larger than the paired ones; facial shield with the greatest (median) depth about two-thirds the greatest (ventral) width, the dorsal margin gently arcuate, ventral margin moderately arcuato-emarginate, lateral margins slightly diverging ventrad, surface smooth; eyes little prominent, rotundato-obtuse cephalo-laterad, gently arcuate laterad, the greatest width of the



FIG. 3.—GALEPSUS CONGICUS. OUTLINE OF HEAD. (X 4.)

eyes contained about one and one-half times in their length; antennæ simple. Pronotum elongate rectangulate, the greatest (supra-coxal) width contained two and one-half times in the greatest length; cephalic margin well arcuate, slightly flattened mesad, cephalo-lateral angles well rounded; lateral margins cephalad of the coxal insertion subequal to the supra-coxal width, caudad of the same distinctly but not greatly narrowed, caudal margin arcuate laterad, truncate mesad; disk of the pronotum with the faintest possible medio-longitudinal sulcus cephalad, an equally faint median carina near the caudal extremity; transverse sulcus at the cephalic third, strongly U-shaped, the arms of the sulcation slightly sinuate and slightly converging cephalad; margins entire. Tegmina with the greatest length about two and one-half times that of the pronotum, slightly surpassing the apex of the abdomen, apex narrowly rotundate. Wings with the costal margin nearly straight, apex rotundato-rectangulate. Supra-anal plate transverse trigonal, angle broadly obtuse, median carina present; cerci depressed, sublamellate, surpassing the subgenital plate, apex missing, proximal joints broader than long; subgenital plate broad, proximad, lateral margins strongly converging caudad, caudal margin very narrow, truncate, styles very short, free. Cephalic coxæ equal in length to about three-fifths of the pronotal length, unarmed on the margins; cephalic femora equal to four-fifths of the pronotal length, moderately compressed, dorsal margin subarcuate proximad, straight distad, ventro-lateral margin with five spines, decreasing in length distad, the distal one on the genicular lobe, ventro-internal margin with 13 spines, more or less alternating in length, discoidal spines 4 in number; cephalic tibiæ (without apical claw) about two-thirds the length of the femora, external margin armed with 10 to 11 spines, internal margin armed with 11 spines increasing in length distad; cephalic metatarsi equal to four-fifths of the tibial length, remainder of the tarsi very slightly shorter than the metatarsi. Median limbs quite short, the femora not more than three-fifths of the pronotal length. Caudal limbs longer than the median ones, the femora but slightly shorter than the pronotum.

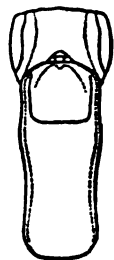


FIG. 4.—GALEPSUS CONGICUS. DORSAL OUTLINE OF HEAD AND PRONOTUM. (X 4.)

General color cinnamon; eyes seal brown; antennæ ochraceous; pronotum clouded with chocolate and with a fine medio-longitudinal line of the same. Prosternum seal brown mesad for the greater portion of its length. Tegmina and wings very faintly infumate, the veins lined with russet and prout's brown.

Measurements.

	mm.
Length of body.....	27.0
Length of pronotum.....	7.0
Greatest width of pronotum.....	2.8
Length of tegmen.....	19.2
Length of cephalic femur.....	5.2

The type is unique.

Subfamily MANTINÆ.

Genus HAPALOMANTIS Stål.

HAPALOMANTIS RHOMBOCHIR (Werner).

1908. *Entella rhombochir* WERNER, Ber. Senck. Naturf. Ges., p. 48, pl. 3, fig. 6.
[No locality.]

Loanda, Angola. One female.

This specimen agrees with individuals from Kamerun.

Genus STENOPYGA Karsch.

STENOPYGA EXTERA Karsch.

1892. *Stenopyga extera* KARSCH, Ent. Nach., vol. 18, p. 146. [Barombi station on Elephant Lake, Kamerun.]

Mount Coffee, Liberia. March, 1897. (R. P. Currie.) One male.

This specimen is inseparable from a Kamerun individual. The range of this species is by this record continued northward along the coast, as the Gold Coast was the previous northern point for the form.

Genus TENODERA Burmeister.

TENODERA SUPERSTITIOSA (Fabricius).

1781. [*Mantis*] *superstitiosa* FABRICIUS, Spec. Ins., vol. 1, p. 348. [Æquinoctial Africa.]

Loanda, Angola. (H. Chatelain.) One female.

Luebo, Kongo. (D. W. Snyder.) One female.

The measurements of these specimens are as follows:

	Luebo.	Loando.
	Mm.	Mm.
Length of body.....	92.0	95.0
Greatest width of head.....	7.0	8.0
Length of pronotum.....	37.0	39.0
Greatest width of pronotum.....	5.5	5.6
Length of tegmen.....	61.0	63+
Greatest width of tegmen.....	8.5	9.6
Length of cephalic femur.....	21.0	22.0
Length of caudal femur.....	33.5	34.5

The previous exact West African records for this species are Mukinbunga, Lower Kongo, Bibunde and Mapanja, Kamerun (Sjöstedt) and Bissau, Portuguese Guinea (Griffini).

Genus POLYSPILOTA Burmeister.

POLYSPILOTA VALIDISSIMA Gerstaecker.

1883. *Polyspilota validissima* GERSTAECKER, Mitth. Naturw. Ver. Neu-Vorpomm., vol. 14, p. 89. [Aburi, Gold Coast.]

Mount Coffee, Liberia. (G. P. Goll.) One male.

Clay Ashland, Liberia. (Mrs. J. E. D. Sharp.) One female.

The specimens of this striking species agree well with the original description and vary in dimensions but a millimeter or so from the type measurements. The range of the species is extended northward from the Gold Coast by these records, while the most southern point from which the species is known is the Gaboon country (Westwood).

The female specimen shows that there is some variation in the coloring of the internal face of the cephalic coxæ, these parts being dark brown as in the male, while in the type female they were described as blackish.

POLYSPILOTA CALABARICA Westwood.

1889. *Polyspilota calabarica* WESTWOOD, Rev. Mantid., p. 35, pl. 11, fig. 2. [Old Calabar.]

Mount Coffee, Liberia. (G. P. Goll.) One male.

This individual agrees quite well with the original description and figure except that the transverse costal tegminal bars are more regularly spaced, much as in males of *P. validissima*. The size is slightly less than that of the type, but this is apparently nothing more than individual variation.

It is quite difficult to understand why Werner¹ synonymized *Miomantis armicollis* Karsch with this species. One of the characters of this species, mentioned by the original describer, is the unarmed condition of the basal portion of the pronotum, while *armicollis*, based on the same sex (male) as *calabarica*, has the margins of the shaft with strong teeth. The range of *calabarica* is considerably extended to the northwest by the Mount Coffee record, the southern limit as far as at present known being the Kamerun.

POLYSPILOTA VARIEGATA (Olivier).

1792. *Mantis variegata* OLIVIER, Encycl. Meth., Ins., vol. 7, p. 638. [Angola.]

Mount Coffee, Liberia. February–April, 1897, and 1897 without month. (R. P. Currie and G. P. Goll.) Six males, fifteen females, one immature male.

Luebo, Kongo. (D. W. Snyder.) One male, three females.

Of the Mount Coffee series of this widespread and polymorphic species four males belong to the color form *pustulata*, two males and

¹ Ber. Senck. Naturf. Ges., 1908, p. 36.

eleven females to the form *striata*, and four females to the form *viridis*.¹ Of the Luebo specimens the male belongs to the *pustulata* form and the three females to the *striata* type.

As measurements of the above series may prove of service in studying the amount of geographic and individual variation in size in this species, I append a table of the dimensions.

	Length of body.	Width of head.	Length of pronotum.	Greatest width of pronotum.	Length of tegmen.	Length of cephalo femur.
MALES.						
March, 1897. Form <i>striata</i>	mm.	mm.	mm.	mm.	mm.	mm.
1897. Form <i>pustulata</i>	7.0	6.8	17.5	5.0	44.5	13.2
April, 1897. Form <i>pustulata</i>	58	7.0	16.5	4.5	42.6	12.2
1897. Form <i>pustulata</i>	6.8	15.0	5.0	42.0	13.0	
No date. Form <i>pustulata</i>	7.0	16.5	4.5	39.0	11.2	
No date. Form <i>pustulata</i>	7.0	17.3	4.5	42.0	12.2	
No date. Form <i>striata</i>	7.0	17.5	4.5	43.0	12.2	
Average of above series of this sex...	58	6.9	17.3	4.6	42.1	12.3
FEMALES.						
March, 1897. Form <i>viridis</i> Werner.....	63	8.2	19.5	6.0	47.0	15.0
April, 1897. Form <i>viridis</i> Werner.....	61	8.2	19.5	6.0	47.0	14.5
1897. Form <i>striata</i>	58	8.2	19.6	6.0	46.0	15.0
Do.....	59	8.2	19.2	6.5	48.0	15.0
Do.....	63	8.2	20.8	6.2	49.0	16.0
April, 1897. Form <i>viridis</i>	57	8.2	19.0	6.0	47.0	14.5
March, 1897. Form <i>striata</i>	59	8.2	19.5	5.8	43.0	14.8
April, 1897. Form <i>striata</i>	64	8.5	20.5	6.5	52.0	16.5
Do.....	63	8.3	20.8	6.2	49.0	16.0
April, 1897. Form <i>viridis</i>	68	8.3	20.0	6.0	50.0	16.0
February, 1897. Form <i>striata</i>	62	8.3	19.5	6.1	49.0	15.2
April, 1897. Form <i>striata</i>	63	8.3	19.7	6.0	48.0	15.0
Do.....	61	8.2	19.5	6.0	49.0	14.5
No date. Form <i>striata</i>	8.3	20.0	6.7	50.0	16.0	
Do.....	8.0	19.2	6.0	46.8	15.2	
Average of above series of this sex...	61.2	8.2	19.7	6.1	48.0	15.2

Genus SPHODROMANTIS Stål.

SPHODROMANTIS LINEOLA (Burmeister).

1838. *M[antis (Stagmatoptera)] lineola* BURMEISTER, Handb. d. Entom., vol. 2, Abth. 2, pt. 1, p. 537. [Sierra Leone.]

Mount Coffee, Liberia. April, 1897, and 1897. (R. P. Currie and G. P. Goll.) Four males, five females, two immature females.

Luebo, Kongo. (D. W. Snyder.) Two females, one immature female.

Loanda, Angola. (H. Chatelain.) Two females.

My study of this and other material causes me to indorse Werner's treatment of *gastrica* Gerstaecker, *bicarinata* Saussure, *kersteni* Stål, and *christina* Kirby as synonyms of this species.² Regarding *rudolfæ*, however, I must differ, as it appears to represent a southern form of the *bioculata* type.³

As the greater portion of the above series has been in alcohol, we can not give any notes on color variation.

¹ See Werner, Ber. Senck. Naturf. Ges., 1908, p. 38.

² Ber. Senck. Naturf. Ges., 1908, pp. 33-34.

³ See Rehn, Proc. Acad. Nat. Sci. Phila., 1911, p. 322.

Genus HOPLOCORYPHA Stål.

HOPLOCORYPHA PERPLEXA, new species.

Type.—Female; Luebo, Kongo. (D. W. Snyder.) [Cat. No. 14604, U.S.N.M.]

A member of the *macra-galeata* group, but readily separable on account of the more elongate pronotum, which has the lateral carinæ of the caudal half of the same irregularly undulate, and by the much slenderer cephalic limbs.

Size rather large (for the genus); form considerably elongate; surface rugoso-tuberculate. Head transverse, the greatest depth contained nearly one and one-half times in the greatest width; occipital line truncate between the juxta-ocular sulci; juxta-ocular lobes rather low, obtuse, not deplanate; ocelli very small, placed in an arcuate line; facial shield with the greatest depth contained one and one-half times in the greatest width, dorsal margin slightly arcuate, ventral margin subarcuate emarginate with a slight median indentation, lateral margins moderately converging dorsad, dorso-lateral angles rect-obtuse, ventro-lateral angles slightly acute; eyes prominent, ovoid when seen from the side; antennæ very delicate, filiform, their length but little greater than the greatest width of the head. Pronotum with the greatest (supra-coxal) width contained about six and one-half times in the length of same, the width at the caudal margin but slightly less than the supra-coxal width; collar distinctly narrower than the shaft, the average width of the former slightly less than a third the length of the same; cephalic mar-

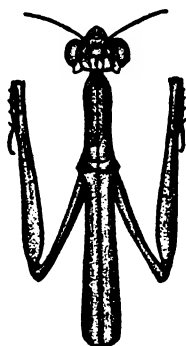


FIG. 5.—HOPLOCORYPHA PERPLEXA. DORSAL VIEW OF HEAD, PRONOTUM, AND CEPHALIC LIMBS. (X 14.)

gin strongly arcuate, slightly flattened mesad, lateral margins of shaft parallel, straight to near the supra-coxal region where the margins expand moderately to the obtuse-angulate lobes, narrowing caudad of the same, and subparallel on the entire shaft, although very slightly but regularly expanding caudad, entire lateral margins denticulate; median carina marked more or less distinctly over the entire pronotal length; transverse sulcus truncate, placed very slightly in advance of the greatest pronotal width; surface more or less distinctly undulato-lineate rugoso-tuberculate, the false lateral carinæ markedly crenulato-undulate; distinct usually paired tubercles placed along the median carina and a semielliptical line of tubercles placed caudad on the collar. Abdominal segments with the medio-dorsal lobe distinct, largest on the second segment; supra-anal plate large, subquadrate,

slightly tectate, caudal margin bisarcuato-truncate, lateral angles broadly rounded; cerci slightly exceeding the supra-anal plate in length, robust, moniliform; subgenital plate strongly compressed distad. Limbs very slender. Cephalic coxæ slightly shorter than half of the pronotal length, of the structure found in the other species of the genus, the margins very finely denticulate, the slenderest portion at the distal third, internal distal lobe strongly developed, rounded: cephalic femora equal in length to about two-thirds that of the pronotum, very slender, tapering regularly from the proximal section, hardly compressed; external margin with five spines, one of which is very small and placed on the genicular lobe, internal margin with eleven¹ to twelve spines of alternating size except distad, where from three to four small spines intervene between the terminal large spine and the one preceding it; discoidal spines three in number, the second very long and surpassing in size the apical tibial claw: cephalic tibiæ slightly less than a fourth the length of the femora, moderately compressed, armed on the external margin with four spines on the distal half, unarmed proximad; internal margin with eight to ten spines; cephalic tarsi not exceeding the tibiæ in length, the metatarsi comprising more than half of the tarsal length. Median and caudal limbs very slender and elongate; tibiæ slightly longer than (caudal) or subequal to (median) the femora; median metatarsi slightly less than two-thirds of the length of the median tarsi; caudal metatarsi about three-fourths of the entire tarsal length.

General colors mottled raw umber and seal brown. Prosternum almost uniform broccoli brown, slightly roseate caudad of the insertion of the cephalic limbs. Cephalic coxæ with their internal faces nearly uniform broccoli brown, external margin beaded with seal brown; cephalic femora with the ventral and part of the internal face solid seal brown. Supra-anal plate and cerci wood brown. Median and caudal tibiæ obscurely biannulate with wood brown proximad.

Measurements.

	mm.
Length of body.....	60.0
Length of pronotum.....	24.5
Greatest width of pronotum.....	3.5
Length of cephalic femur.....	16.5
Length of median femur.....	16.5
Length of caudal femur.....	19.0

An imperfect paratypic specimen has also been examined. It is considerably smaller than the type and, having lost the apex of its abdomen, the sex can not be ascertained. No point of difference from the type can be found.

¹ This appears to be abnormal and due to injury to certain spines.

HOPLOCORYPHA BOVIFORMIS, new species.

Type.—Male; St. Paul de Loanda, Angola. [Cat. No. 14605, U.S.N.M.]

Allied to *H. boromensis* Brancsik from Zambesia and *H. bispina* Saussure and Zehntner from Madagascar, differing from both in the extremely slender form of the pronotum and the spiniform character of the juxta-ocular lobes. From *bispina* it also appears to differ in the smaller size.

Size rather small; form elongate; surface closely and finely tuberculate. Head with the greatest depth contained one and one-half times in the greatest width; occipital outline truncate between the juxta-ocular sulci, juxta-ocular lobes rectangulate with the apices acute, mammiform, diverging, the lobes very slightly depressed; ocelli rather small, placed in an arcuate line; facial shield strongly transverse, dorsal margin truncate mesad, obliquely arcuato-emarginate laterad, ventral margin slightly arcuato-emarginate, lateral portions very narrow; antennæ slightly shorter than half of the pronotal length, simple; eyes very prominent, subglobose, ovoid in form when seen from the side. Pronotum slender, elongate, the greatest (supra-coxal) width contained nearly six times in the length; collar markedly tapering cephalad from the supra-coxal angles to the middle of the collar, thence subequal cephalad to the strongly rounded cephalic extremity, supra-coxal angles very slight but distinct; shaft slightly tapering caudad to the caudal third, thence subequal to the truncate caudal margin; lateral margins of the whole pronotum denticulate, a slight but distinct median scarina present throughout the pronotal length, transverse sulcus U shaped, not severing the median carina; paired supplementary carinæ on the shaft distinctly concavo-arcuate, closely and finely tuberculate, the tuberculations of the other (more lateral) portions of the shaft and of the collar arranged in linear fashion. Abdomen without marked medio-dorsal lobes on the caudal margin of the segments; supra-anal plate with the proximal width slightly greater than the length, lateral margins arcuato-convergent caudad, apical margin bisarcuate; cerci but slightly surpassing the supra-anal plate, deplanate, moderately broad, apex acute; subgenital plate with the distal half of the lateral margins converging distad, the apical extremity very narrow,

FIG. 6.—HOPLOCORYPHA BOVIFORMIS. DORSAL OUTLINE OF TYPE. (X 2.)

the very brief tuberculiform styles subcontiguous at their bases. Limbs of the slender type found in all of the species of the genus. Cephalic coxæ about half of the pronotal length, margins finely denticulate; cephalic femora about two-thirds the length of the pronotum, the distal extremity considerably curved dorsad, external margin armed with five spines, of which the distal one is on the genicular lobe and very rudimentary in character; internal margin with twelve spines, alternating in size, except that the distal large spine is preceded by three small ones; discoidal spines three in number the second slightly exceeding the apical tarsal claw in length; cephalic tibiæ (without apical claw) very slightly more than a fourth of the femoral length; external margin armed on the distal half with four spines; internal margin with nine spines; cephalic tarsi hardly longer than the tibiæ; metatarsus comprising two-thirds of the entire tarsal length. Median and cephalic limbs very slender, the median femora about three-fourths of the length of the caudal femora; median and caudal tibiæ slightly shorter than their respective femora; caudal metatarsi comprising about three-fourths of the entire tarsal length.

General colors prout's brown and ecru drab, one lined and washed over the other. Head with the face and the proximo-cephalic portion of the eyes prout's brown finely punctulate with olive, remainder of eyes clear tawny-olive; facial shield and region immediately ventrad of the insertion of the antennæ nearly clear wood brown. Pronotum with a medio-longitudinal bar of ecru drab, slightly expanded in the supra-coxal region and regularly expanding caudad on the caudal half of the shaft, lateral portions of the shaft weakly barred in a similar direction with the same color. Mesonotum and metanotum with paired lateral lines of prout's brown, laterad of which the color is ecru drab. Abdomen with a distinct medio-longitudinal bar of prout's brown. Limbs of the general colors clouded with tawny-olive; dark punctulations and internal longitudinal bars decided on the cephalic femora.

Measurements.

	Male (type).	Female (para- type).
	mm.	mm.
Length of body.....	27.0	38.5
Length of pronotum.....	11.2	13.5
Greatest width of pronotum.....	1.9	2.3
Length of cephalic femur.....	7.7	10.0
Length of median femur.....	9.0	10.0
Length of caudal femur.....	10.7	12.0

I have before me a female paratype, which fully agrees with the type in all important characters, allowing, of course, for sexual differentiation in proportions. A few notes, however, may not be amiss.

Form less elongate than in the male. Ocelli very small; facial shield with median truncate portion of the dorsal margin broader than in the male. Pronotum with the proportions the same. Abdomen with very small but distinct median lobes on the dorso-caudal margins of the segments, all segments multineate; supra-anal plate similar to that of the male in form but more tectate.

Color more uniform prout's brown, washed with ashy brown cephalad, with almost no clear ecru drab areas; pronotum without any portions of clear prout's brown; cephalic femora without dark areas on the internal faces; abdomen nearly uniform prout's brown.

Genus CALIDOMANTIS Rehn.

CALIDOMANTIS HOSIA,¹ new species.

Type.—Female; Luebo, Kongo. (D.W. Snyder.) [Cat. No. 14606, U.S.N.M].

Allied to *C. büttneri* Giglio-Tos,² from western, central, and southern Africa, but differing in the rotundato-subconoid eyes and the shorter tegmina and wings. It is also related to *minuta* Giglio-Tos, from the Cape of Good Hope, but it can readily be separated by the greater size of the body and the granulate pronotum.

Size rather small; form moderately elongate. Head large, the greatest width nearly twice the greatest width of the pronotum, the greatest depth of the head contained one and one-half times in the greatest width of the same; occipital outline arcuato-truncate between the juxta-ocular sulci, the portion between the sulci and the eyes distinctly arcuate declivent; ocelli small, placed in an arcuate line; facial shield strongly transverse, the greatest depth contained over three times in the width, dorsal margin narrowly truncate mesad, moderately arcuato-emarginate laterad, lateral margins arcuate, ventral margin subtruncate; antennæ simple, equal to four-fifths the length of the pronotum; eyes moderately prominent, broadly rotundato-rectangulate dorso-laterad when viewed from the front, the angle equally rounded when seen from above. Pronotum with the greatest (supra-coxal) width contained about three and one-half times in the length of the same, the collar much broader than the shaft and but little narrower than the supra-coxal expansion; cephalic margin strongly rounded with a slight median truncation, lateral margins of collar subparallel, gently expanding to the arcuate but not strongly marked supra-coxal lobes; shaft moderately and broadly narrowed, slightly expanding cephalad and caudad; caudal margin broadly truncate mesad, strongly arcuate laterad, entire lateral margins denticulate; a medio-longitudinal sulcus present for a distance

¹ *Osm*—signifying *pious*, *devout*.

² Bull. Soc. Ent. Ital., vol. 41, 1911, p. 181.

cephalad and caudad of the transverse sulcus, which latter is well impressed; collar with a fairly complete elliptical carinate figure, which touches the transverse sulcus caudad; surface of the entire pronotum acute tuberculate. Tegmina slightly more than one and one-third times the length of the pronotum, elongate-ovate, subhyaline proximad in the sutural section, remainder opaque; costal margin broadly arcuate, slightly flattened mesad, sutural margin moderately arcuate, apex rotundato-rectangulate; costal veins numerous, stigma small, linear, placed slightly proximad of the middle. Wings about equal in length to the combined length of the head and pronotum, opaque; costal margin straight in the proximal two-thirds, strongly arcuate in the distal third, the immediate apex rounded acute-angulate, sinus distinct and moderately deep. Apex of abdomen missing. Cephalic coxæ distinctly compressed; dorsal margin with 5 to 6 teeth, between which are intercalated one or more smaller denticles; ventral face thickly denticulate, the denticulations adpressed; external margins finely denticulate; internal face of the coxæ with a few tubercles: cephalic femora slightly shorter than the pronotum, the greatest depth of the femora contained four times in the length of the same; dorsal femoral margin straight, finely crenulato-denticulate; external margin with 5 spines, of which the distal is very small and placed on the genicular lobe; internal margin with 14 spines, the distal one on the genicular lobe and the formulæ reading proximad being I I I I I I I I I I; discoidal spines 4 in number: cephalic tibiæ, exclusive of apical claw, slightly less than half of the femoral length, armed on the external margin with 7 spines placed on the median and distal portions, internal margins with 11 spines increasing in size distad: cephalic tarsi slightly longer than the tibiæ, exclusive of claw, the metatarsi slightly more than half of the entire tarsal length. Median and caudal limbs moderately slender; median femora nearly three-fourths the length of the pronotum; median tibiæ slightly shorter than the femora; caudal femora but slightly shorter than the pronotum; caudal tibiæ slightly exceeding the femora in length.

FIG. 7.—*Calidomantis hosi*. DORSAL VIEW OF TYPE. (X 2)

General color wax yellow, becoming gamboge yellow on the tegmina and wings, head inclined toward buff; eyes clay color; cephalic coxæ non-maculate; cephalic femora with three points of seal brown on the internal face, one decidedly proximal, one larger one immediately distad of the unguinal groove and one smaller one immediately proximad of the same, larger spines on the internal margin of the caudal femora lined on the internal margin and spotted at the internal base with seal brown, all the femoral and tibial spines tipped more or less broadly with the same color.

Measurements.

	mm.
Length of body (incomplete as apex of abdomen is missing).....	25.0
Length of pronotum.....	11.0
Greatest width of pronotum.....	2.8
Length of tegmen.....	13.8
Greatest width of tegmen.....	5.0
Length of cephalic femur.....	9.5
Length of median femur.....	8.0
Length of caudal femur.....	10.0

The type of this species is unique.

Subfamily CREOBOTRINÆ.

Genus PANURGICA Karsch.

PANURGICA LIBERIANA, new species.

Type.—Male; Mount Coffee, Liberia. (G. P. Goll.) [Cat No. 14607, U.S.N.M.]

Differing from *P. duplex* Karsch as figured by Werner¹ in having the cephalic spine shorter, the pronotum more elongate and decidedly oblique truncate lateral instead of subrectangulate and in the different shape of the lateral pronotal margin when seen from the side.

Size medium; form as usual in this genus. Head with the greatest depth contained one and two-fifths times in the greatest width; occipital line with the portion between the sulci subtruncate, juxta-ocular lobes low, rotundato-rectangulate, the angle nearer the eye than the sulcus, subtrigonal when viewed from the side; cephalic spine trigonal, depressed, distal portion slightly curved dorsad, when viewed from the dorsum the apex of the spine not surpassing the ocelli; ocelli large, subcontiguous, placed in a flattened triangle; facial shield transverse, the greatest depth about one and one-half times in the greatest width, dorsal margin with a marked median arcuate emargination, which is flanked laterad by low trigonal tubercles, the margin obliquely declivent laterad, ventral margin broadly concave, lateral margins parallel, straight, surface of plate impressed with a pair of lateral carinæ converging ventrad; clypeus subproduced dorso-

¹ Ber. Senck. Naturf. Ges., 1906, pl. 3, figs. 4a, 4b.

mesad; antennæ reaching nearly to the middle of the tegmina, moniliform; eyes strongly inflated, ovato-globose, the dorsal outline, when viewed from the lateral aspect, slightly oblique depressed. Pronotum of the usual type found in the genus, the area of greatest expansion contained about one and one-fifth times in the length; cephalic portion of margins narrowly rounded, thence laterad oblique emarginato-truncate to the portion of greatest width, caudad of this for a short distance truncate and slightly convergent, then strongly arcuato-truncate convergent to the narrowest portion, the caudal section of the pronotum with the margin broadly rounded, lateral margins serrulate; transverse sulcus strongly marked, placed very slightly before the middle, another transverse impression placed slightly caudad of the portion of least width; dorsal outline of the pronotum triarcuate when seen from the side, the central portion of the collar strongly compressed, or rather pinched, dorsad; re-entrant right angle of the lateral margins ventrad of the supplementary transverse depression decided. Tegmina very ample, nearly three and one-half times the combined length of the head and pronotum, subhyaline; marginal field narrow, distinctly narrowed in the distal half; apex of tegmina rotundato-angulate. Wings similar in texture to the tegmina and with their apices slightly surpassing those of the same. Abdomen with the proximal segments shallowly rotundato-lobate laterad, distal segments with their angles moderately acute-produced; supra-anal plate transverse, distal margin triarcuate, the median arcuation about twice as wide as the lateral ones; cerci subfusiform, moderately depressed, strongly hirsute; subgenital plate deplanate, moderately produced, distal margin rotundato-truncate, styles very short. Cephalic coxæ subequal to the length of the head and pronotum, slightly compressed; external margin serrulate, dorsal margin rather sparsely serrato-dentate, usually with smaller intercalated serrulations: cephalic femora slightly longer than the coxæ, strongly compressed, the dorsal portion sublamellate; dorsal femoral margin arcuato-truncate; ventro-lateral margin with five spines, four large, the distal one small and placed on the genicular lobe; ventro-internal margin armed with 13 spines of alternating size, the distal one of the smaller grade and placed on the genicular lobe; discoidal spines four in number: cephalic tibiæ slightly more than two-thirds the length of the femora, considerably arcuate ventrad in the distal section; armed on the external margin with 12 adpressed spines, increasing in length distad: internal margin armed with 11 spines, increasing in length distad: cephalic tarsi two-thirds the length of the femora,



FIG. 9.—PANUR-
GICA LIBE-
RIANA. LATERAL OUT-
LINE OF PRONO-
TUM OF TYPE.
(X 3.)



FIG. 8.—PAN-
URGICA LIBE-
RIANA. DOR-
SAL OUTLINE
OF PRONO-
TUM OF TYPE.
(X 3.)

placed on the genicular lobe; ventro-internal margin armed with 13 spines of alternating size, the distal one of the smaller grade and placed on the genicular lobe; discoidal spines four in number: cephalic tibiæ slightly more than two-thirds the length of the femora, considerably arcuate ventrad in the distal section; armed on the external margin with 12 adpressed spines, increasing in length distad: internal margin armed with 11 spines, increasing in length distad: cephalic tarsi two-thirds the length of the femora,

metatarsi equal to half of the entire tarsal length. Median and caudal limbs with the femora lamellato-carinate on the ventro-caudal margin, this developing into a rotundato-trigonal pregenicular lobe; tibiae appreciably constricted before the apex.

General color wood brown to russet, thickly washed, mottled and punctulate with mummy brown; tegmina and wings pale clay color, the former with a premedian touch of mummy brown, caused by infuscation along several contiguous veins, and a slight touch of the same at the distal third, the latter with the apices edged with mummy brown. Head with the face chiefly russet, the occiput and two more or less complete transverse lines, one at the level of the ocelli, the other at the upper line of the clypeus, mummy brown; antennae russet, becoming darker distad; eyes clove brown. Pronotum with the cephalic half of the lateral portions pale, mummy brown punctulate, the remainder of the pronotum darkened, but similarly punctulate and clouded. Limbs more or less distinctly and more or less completely annulate with the two base colors, the dark areas broader than the pale areas, the latter on the cephalic limbs with dark punctulations; internal face of the cephalic coxæ and femora nearly solid seal brown, the dorsal section of the latter with fasciæ similar to those of the external face, the smaller spines on the ventro-internal margin pale, tipped with seal brown.

Measurements.

	mm.
Length of body.....	23.0
Length of pronotum.....	6.0
Greatest width of pronotum.....	4.6
Length of tegmen.....	25.5
Length of cephalic femur.....	8.3
Length of median femur.....	6.2
Length of caudal femur.....	7.2

The type of this species is unique.

PANURGICA FRATERCULA, new species.

Type.—Male, Mount Coffee, Liberia. (G. P. Goll.) [Cat. No. 14608, U.S.N.M.]

Allied to the preceding species but differing in the smaller size, the much less prominent and less angulate lateral expansions of the pronotum and much lower dorsal swellings of the disk of the same.

Size rather small; form slenderer than in the preceding species. Head as in *liberiana* except for the following points of difference: occipital line moderately concave, juxta-ocular lobes very low, merely rounded bosses; cephalic spine narrower and more spiniform. Pronotum of the type usual in this genus but more longitudinal than in *liberiana*, the greatest width contained one and two-fifths times in

the length of the same; cephalic portion of the lateral margins less diverging, oblique subtruncate, lateral angles very blunt, the margins regularly arcuate mesad thence to the point of least width, lateral margins finely crenulate-serrulate; caudal portion of the pronotum with broadly rounded margins which are subtruncate mesad, entire; transverse sulcus well impressed; caudal transverse depression less impressed than the transverse sulcus and not quite as evident as in *liberiana*; when viewed from the side the dorsal outline is lower and more undulate than arcuate as in *liberiana*, central portion of collar similarly compressed but less decided; rectangulate section of lateral margins similar to *liberiana*. Tegmina and wings as in *liberiana*. Abdominal segments non-lobate laterad; supraanal plate transverse, margin slightly concave over the cerci, apex rounded; cerci and subgenital plate much as in *liberiana*. Cephalic limbs much as in the preceding species, but more slender; femora with ventro-internal margin armed with thirteen spines usually alternating in size; tibiae with thirteen external and internal spines. Median and caudal limbs similar to those of *liberiana* but the pregenicular femoral lobes are lower.



FIG. 11.—PANURGICA FRATERCULA. LATERAL OUTLINE OF PRONOTUM OF TYPE. (X 3.)



FIG. 10.—PANURGICA FRATERCULA. DORSAL OUTLINE OF PRONOTUM OF TYPE. (X 3.)

Coloration as in *liberiana* but with the pronotum less mottled and the limbs less distinctly annulate. Antennæ seal brown, pronotum washed with the same color, tegmina with a single minute spot proximad of the distal third and another extremely faint one slightly proximad of the middle; internal face of the cephalic coxæ and femora wood brown, suffused in the region of the trochanter with seal brown and along the dorsal margin of the femora with a continuation of the bands of the external face.

Measurements.

	mm.
Length of body.....	19.8
Length of pronotum.....	5.0
Greatest width of pronotum.....	3.6
Length of tegmen.....	22.5
Length of cephalic femur.....	7.5
Length of median femur.....	6.0
Length of caudal femur.....	6.5

In addition to the type we have before us a paratypic male, which is very slightly smaller than the typical individual but otherwise identical.

The presence of a third species of this genus at Mount Coffee is indicated by an additional broken specimen (R. P. Currie, 1897), minus head and most of the limbs.

Genus **PSEUDOCREOBOTRA** Saussure.**PSEUDOCREOBOTRA OCELLATA** (Beauvois).

1805. *Empusa ocellata* BEAUVOIS, Ins. Rec. Afr. Amer., p. 110, Orth., pl. 13, fig. 2. ["Les déserts du royaume d'Oware."]

Mount Coffee, Liberia. April, 1897. (R. P. Currie.) One female.

Mount Coffee, Liberia. (Mrs. Sharp.) One male.

Luebo, Kongo. (D. W. Snyder.) One male, one female.

Kongo. (J. H. Camp.) One female.

The measurements of these specimens are as follows:

Locality.	Length of body.	Length of pronotum.	Greatest width of pronotum.	Length of tegmen.	Length of cephalic femur.
	測度.	測度.	測度.	測度.	測度.
Mount Coffee, male.....	22.5	4.8	4.8	28.5	7.5
Luebo, male.....	24.5	5.5	5.8	27.0	8.5
Mount Coffee, female.....	27.5	5.5	5.5	25.0	9.0
Luebo, female.....	30.5	6.3	6.2	25.0	10.0
Kongo, female.....	31.0	6.5	6.5	26.5	10.5

The Mount Coffee female has the eye-spot and a large basal spot on the axillary field of the wing bright brick red.

Subfamily **VATINÆ**.Genus **DANURIA** Stål.**DANURIA ANGOLENSIS**, new species.

Type.—Male; Loanda, Angola. [Cat. No. 14609, U.S.N.M.]

Differing from *D. thunbergi* Stål, the type of the genus, and apparently from the other known forms of this group as now restricted, in having the pronotum shorter and more robust in the male sex, the length of the same being considerably less than half that of the tegmina. The lateral margins of the pronotum are dentate in their entirety, while the maculation at the apex of the internal face of the cephalic coxæ is very faint, single, and transverse in character. Comparison with the species known only from the male sex is quite unsatisfactory, but this form seems very distinct from the three species known only from that sex.

Size rather large; form robust for the male sex of this genus. Head with the median depth contained one and one-half times in the greatest width; occipital outline arcuato-subangulate concave between the juxta-ocular sulci; juxta-ocular lobes acute, conical, directed dorsad or in the line of the axis of the eyes, their height above the dorsal portion of the eyes one-third of the depth of the latter, deplanate; paired supraocular median tubercles low, rotundato-acute; ocelli moderately large, placed in a depressed triangle;

facial shield strongly transverse, the general form arcuate dorsad, dorsal margin narrowly subtruncate mesad, arcuato-emarginate laterad of the same, ventral margin moderately arcuato-emarginate; eyes prominent, rounded, when viewed from the side seem to be pyriform-ovate; antennæ missing. Pronotum with the greatest (supra-coxal) width contained nearly five times in the length of the same, shaft two and one-half times the length of the collar; cephalic extremity well rounded, margins of collar gradually tapering from shortly cephalad of the supra-coxal insertion to the distal extremity; supra-coxal lobes but little expanded, rounded; shaft subequal in width for a distance caudad of the supracoxal lobes, thence slightly expanding caudad to the caudal margin, which is truncate mesad and obliquely arcuato-truncate laterad; median carina present on the whole shaft and the greater portion of the collar, placed for the greater part of its length in a narrow sulciform depression; surface of shaft sparsely but regularly tuberculate, surface of collar subdeplanate mesad, a deeply impressed ovate figure failing to reach the much shallower transverse sulcus, this figure strongly outlined with marginal carinæ laterad and flanked mesad with three to four distinct tubercles on each side and some scattered smaller median ones; lateral margins of the whole pronotum dentato-spinose, the spines of greatest length on the median portion of the shaft. Tegmina and wings over twice the length of the pronotum; marginal field of the former moderately wide proximad, gradually narrowing distad. Abdomen with the apex missing. Cephalic coxæ two-thirds the length of the pronotum; ventral surface sparsely tuberculate, ventro-internal margin serrato-denticulate; external margin serrulate; dorsal margin with the distal lamellation forming about one-third of the entire length, the margin of the same with eight to nine decided denticulations, the dorsal margin proximad of the lamellation arcuato-emarginate, proximal portion of the same margin serrato-denticulate: cephalic femora slightly exceeding the pronotal shaft in length, very slender, dorsal margin nearly straight with a blunt subtrigonal depressed supra-genicular projection; ventro-external margin armed with five spines, one very small and genicular in position; ventro-internal margin armed with fourteen spines placed in the following fashion (reading from the distal extremity) I I I I I I I I I I, the distal one small, genicular and well separated from the others; discoidal spines four in number: cephalic tibiæ (exclusive

FIG. 12.—*DANURIA*
ANGOLENSIS.
DORSAL VIEW OF
HEAD AND PRONOTUM OF TYPE.
(X 3.)

of apical claw) about two-fifths of the femoral length, moderately compressed, armed on the external margin with eight spines on the median and distal portions, on the internal margin with twelve spines, increasing in length distad: cephalic tarsi somewhat longer than the tibiae, the metatarsus equal to half of the tarsal length. Median and cephalic limbs slender, the femora and tibiae moderately compressed.

General color cinnamon becoming mars brown on the tegmina; pronotum mottled rather irregularly with olive, the larger dorsal tubercles and the marginal denticulations touched with the same; region of the tegminal stigma clouded with vandyke brown; wings very strongly infumate (as usual in the genus); proximal abdominal segments broadly margined dorso-caudad with shining seal brown; cephalic coxae washed at the proximal extremity of the internal face, along the lamellate ridge and around the insertion with seal brown, distal extremity of the internal face with the usual bar very weak seal brown and transverse in position, a narrow distal margin of the same present; internal margin of cephalic tibiae with three poorly defined oblique fasciae of seal brown.

Measurements.

	mm.
Length of body (minus apex of abdomen).....	62.0
Length of pronotum.....	19.5
Greatest width of pronotum.....	4.0
Length of tegmen.....	44.0
Length of cephalic femur.....	15.0
Length of median femur.....	13.0
Length of caudal femur.....	17.5

The type of this species is unique.

Family PHASMIDÆ.

Subfamily OLITUMNINÆ.

Genus GRATIDIA Stål.

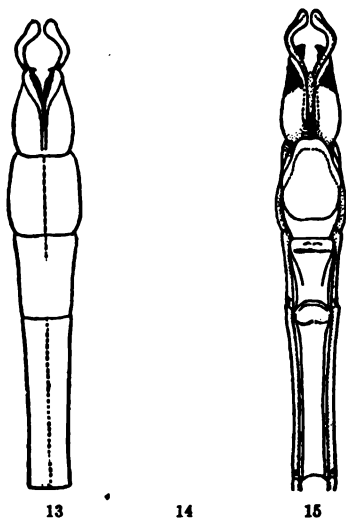
GRATIDIA PULCHRIPE, new species.

Type.—Male; Luebo, Kongo. (D. W. Snyder.) [Cat. No. 14610, U.S.N.M.]

Related to *G. kibonotensis* Sjöstedt, *insulsa*, *montana*, and *specifica* Brunner and *linea-alba* Rehn, but differing from these as follows: from *kibonotensis* in the subequal and straight (laterally viewed) cerci, which also project considerably caudad of the anal segment, in the less distinctly emarginate distal margin of the subgenital plate and in the far greater size; from *insulsa* in the greater size and non-carinate abdomen; from *montana* in the much longer limbs (cephalic femur 31.5 instead of 25), although the general size is about the

same; from *specifica* in the lobes of the anal segment being produced rectangulate, in the caudal point of insertion of the cerci and in the distinctly incurved form of the same; from *linea-alba* in the peculiar character of the apex of the cerci and the more inflated subgenital plate.

Size rather large (for the genus); form very elongate, limbs exceedingly slender. Head distinctly longer than the prothorax, somewhat narrowed caudad, with a very slight transverse inflation between the eyes, medio-longitudinal sulcus slight; occipital margin with a median pair of subconical tubercles; eyes subspherical, moderately prominent; antennæ seventeen-jointed, in length slightly less than half that of the cephalic femora. Prothorax with the lateral margins slightly constricted cephalad; cephalic margin regularly arcuato-emarginate, caudal margin truncate. Mesothorax slightly more than six times the length of the prothorax, very delicately carinate in all but the extreme caudal section, which is very finely sulcate. Metathorax, including the median segment, nearly equal to the mesothorax in length, very delicately carinate; median segment quadrate but very slightly longitudinal, cephalic margin very obtusely angulate, caudal margin arcuato-emarginate. Abdomen with the segments longitudinal, all except the distal ones very decidedly so, not distinctly carinate except near the apex where several lateral and a median carinæ are moderately marked; anal segment compressed, subtectate, strongly carinate dorsad, distinctly fissate for some distance, from the side the caudal margin is truncate, very slightly rounded dorsad, distinctly rectangulate produced ventrad, internally strongly denticulate, ventral line of anal segment subtruncate except for a slight arcuate emargination at the cercal insertion, which is near the caudal extremity; cerci straight (from side), subequal, slightly thickened and rounded distad, from the dorsum they are seen to be distinctly bowed and slightly knobbed at the apex; subgenital plate moderately inflated with the caudal margin bisarcuate. Cephalic femora but slightly shorter than the head and thoracic segments; cephalic tibiæ exceeding the femora by the length of the head and pronotum. Median femora equal in length to the head and pro- and mesothorax; median tibiæ some-



FIGS. 13-15.—*GRATIOLA PULCHRIPES*. DORSAL, LATERAL, AND VENTRAL OUTLINES OF APEX OF ABDOMEN OF TYPE. (X 5.)

what exceeding the femora. Caudal femora equal to three-fourths the length of the cephalic femora; tibiæ exceeding the femora by more than the length of the head.

General color pale pea green, the cerci, head, antennæ and prothorax strongly washed with seal brown; limbs russet, the distal extremities of the femora seal brown, this area bordered proximad on the median and cephalic limbs by a broad irregular annulus of cream white, pads of the tarsi cream white, in striking contrast to the general coloration.

Measurements.

	mm.
Length of body.....	69.5
Length of pronotum.....	2.5
Length of mesonotum.....	15.0
Length of metanotum (including median segment).....	14.0
Length of cephalic femur.....	31.5
Length of median femur.....	20.8
Length of caudal femur.....	26.0

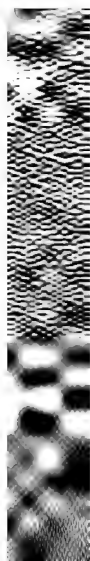
An imperfect male specimen from the type locality has been examined in addition to the type. This individual is somewhat smaller than the type but otherwise does not differ in the essential characters.

GRATIDIA CRYPTOCERCATA; new species.

Type.—Female; Kongo. [Cat. No. 14611, U.S.N.M.]

Allied to *G. reducta* Brunner¹ from German East Africa, agreeing in the hidden cerci, but differing in the bicarinate instead of tricarinate ventral abdominal segment, much more elongate operculum, and larger size.

Size moderately large; form moderately elongate. Head slightly more than one and one-half times the prothoracic length, regularly but not very greatly narrowing caudad, interocular region hardly inflated; occipital margin with a pair of very low and weak median tubercles separated by a shallow depression of the margin; eyes subglobose, hardly prominent; antennæ imperfect, fifteen joints present. Prothorax with the lateral margins subparallel caudad, slightly arcuate constricted cephalad; cephalic margin decidedly arcuato-emarginate, caudal margin truncate; median transverse sulcus arcuate caudad. Mesothorax falling short of the length of the median femora by that of the prothorax, with the



16

17

FIGS. 16, 17.—*GRATIDIA CRYPTOCERCATA*. LAT. LATERAL AND VENTRAL VIEW OF APEX OF ABDOMEN OF TYPE. (X 5.)

median transverse sulcus arcuate caudad. Mesothorax falling short of the length of the median femora by that of the prothorax, with the

¹ Insektenfam. Phasm., vol. 2, p. 228.

faintest trace of a median carina. Metathorax half the length of the cephalic femora, carinate in similar fashion to the mesothorax; median segment slightly transverse, cephalic and caudal margins of segment arcuate cephalad. Abdomen with all except the extreme distal segments distinctly longitudinal, a weak median carinæ and two pairs of lateral carinæ more or less distinct, but never strongly marked; anal segment, longitudinal compressed, strongly tectate, median carina distinct, caudal margin arcuate with a small but deep V-shaped median emargination exposing the small subdigitiform supra-anal plate; cerci completely hidden; operculum lanceolate, reaching nearly to the apex of the anal segment, non-carinate; seventh ventral abdominal segment margined laterad by prominent carinæ and with a distinct median pair of the same, distal margin produced into an acute-angulate roughened lobe. Cephalic femora falling but little short of the meso- and metathorax in length; tibiæ very slightly exceeding the femora. Median femora equal to about two-thirds the cephalic femoral length; tibiæ exceeding the femora by half the prothoracic length. Caudal limbs missing.

General color prout's brown, becoming wood brown on the head and more or less washed with the same color on the limbs and with écru drab on the apex of the abdomen.

Measurements.

	mm.
Length of body.....	77.0
Length of prothorax.....	2.5
Length of mesothorax.....	15.0
Length of metathorax (incl. med. segm.).....	12.6
Length of cephalic femur.....	25.0
Length of median femur.....	17.5
Length of caudal femur.....	

The type is unique.

DESCRIPTION OF A NEW TERRESTRIAL ISOPOD BELONGING TO THE GENUS CUBARIS FROM PANAMA.

By HARRIET RICHARDSON,

Collaborator, Division of Marine Invertebrates, United States National Museum.

Two specimens of an isopod, representing a new species of *Cubaris*, were collected by Mr. E. A. Schwarz at Porto Bello, Panama, where he found it to be very abundant. Mr. Schwarz says that he "frequently beat it down on his umbrella from bushes or trees after heavy showers and during the drier weather it was to be found under rubbish on the ground. Smaller specimens were also seen but not collected. The species was not seen in the Canal Zone proper."

CUBARIS LONGISPINIS, new species.

Body contractile, capable of being rolled into a ball; dorsal surface covered with long spines; color brown, mottled with yellow.

Head wider than long; front slightly excavate in the middle, the antero-lateral angles produced and rounded; eyes small, round, composite, situated close to the lateral margin, half way between the anterior and posterior margins. Just back of the anterior margin is a row of four short spines, two on either side of the median line, the two outer being slightly longer than the two inner. (See fig. 1.) Close to the posterior margin is a row of six long spines, three on either side of the median line, the two outer and the two inner being longer than the others. Between the two rows of spines are two small spines, one on either side of the median line. Altogether there are twelve spines on the head. First antennæ small and inconspicuous; second antennæ with a flagellum composed of two articles, the second of which is twice as long as the first.

First segment of the thorax, with the lateral parts large and expanded, the antero-lateral angles extending forward as far as the antero-lateral angles of the head, the post-lateral angles being

rounded; dorsal surface of lateral parts concave, with the margins produced laterally. There are thirteen spines on the first segment. Close to the anterior margin are two short spines, one on either side of the median line. There is a row of eight long spines at about the middle of the segment, four on either side of the median line. Close to the posterior margin is a row of three spines, one in the median line with one on either side. The coxopodites of this segment extend one-half the length of the lateral margin on the underside, are unequally cleft, and are situated some distance from the edge; they are posteriorly rounded. (See fig. 2.) Each of the following six segments is armed with eleven spines, arranged in an anterior row of eight, four on either side of the median line and a posterior row of three, one in the median line with one on either side. On the third to the seventh segments is an additional small spine on either side at the base of the out-

FIG. 1.—*CUBARIS LONGISPINIS*. $\times 10$.

ermost lateral spine. The lateral parts of the second, third, and fourth segments are drawn out laterally in narrow, acutely ending processes; those of the fifth and sixth segments are wider, and produced downward; those of the seventh are the width of the segment, with only the posterior angle acutely produced. The coxopodites of the second segment are present on the underside, some distance from the edge, and are rounded plates.

First segment of the abdomen entirely concealed; second segment short, with the lateral parts covered by those of the seventh thoracic segment; it is unarmed; third and fourth segments furnished each with a row of six spines, three on either side of the median line, the outermost being placed on the lateral portion of the segment; fifth and sixth segments each provided with two spines, one on either side of the median line; sixth or terminal segment constricted about the middle and truncate posteriorly; peduncle of the uropoda occupying the space between the sixth segment and the lateral parts of the fifth; outer branch minute and placed at the inner post-lateral angle of the peduncle; inner branch short and not quite reaching the extremity of the sixth abdominal segment (seen from the underside).



FIG. 2.—*CUBARIS LONGISPINIS*. UNDERSIDE OF FIRST AND SECOND THORACIC SEGMENTS SHOWING COXOPODITES. $\times 10$.

The legs are all alike, ambulatory.

Only two specimens were collected by Mr. Schwarz at Porto Bello, Panama.

The types are in the United States National Museum, Cat. No. 43501.

The present species is closer to *Diploezochus* [*Cubaris*] *echinatus* Brandt from Brazil than to any other-described species of the genus. Budde-Lund,¹ in his description of that form, mentions twenty spines on the first segment of the thorax, and says there are twelve on each of the following segments. He also describes the terminal abdominal segment as having the apex arcuate emarginate with the external angle a little produced backward. He describes the basal article of the uropoda as acute at the apex with the exterior branch inserted above the incision of the basal article. He also mentions only four spines on each of the third and fourth segments of the abdomen. In that species, the epimera of the third segment of the thorax also are cleft. The epimera of the six posterior segments of the thorax are furnished with a horizontal process on either side.

¹ Crustacea Isopoda Terrestria, 1885, pp. 26-27.

A NEW DISCODRILID WORM FROM COLORADO.

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The material on which this account is based was received through the kindness of Prof. T. D. A. Cockerell. It consists of two sets of worms. Forty-five specimens of this Discodrilid were found on two specimens of *Cambarus diogenes* Girard in the University of Colorado museum, labeled "Boulder, Colorado, July 24, 1908." Another lot of about 300 worms came from five specimens of *Cambarus diogenes* Girard collected on the University of Colorado campus, July 9, 1911. One of the crayfish, a medium-sized male, carried quite a number of the stalked eggs of this worm on the underside of its abdomen. The writer is indebted to Miss Margaret Hankins, who discovered this second lot of worms, for information concerning the living animals; to Mr. E. Bethel, of East Denver, for carefully preserving these specimens; and to Prof. J. P. Moore, of the University of Pennsylvania, for the loan of a valuable reprint.

All the figures were made from camera lucida drawings, except fig. 4.

CAMBARINCOLA, new genus.

This genus is easily distinguished from *Bdellodrilus* Moore by the noneversible penis, by the eversible bursa, by the simple spermatheca, by the large accessory tube connected with the male reproductive organs in segment 6, and by the absence of the conspicuous, clear, paired, segmental glands in the first nine post-cephalic segments. It is separated from *Branchiobdella* Odier by the single, median dorsal, pulsatile papilla carrying the single common opening of the anterior nephridia, by the possession of two pairs of testes and vasa deferentia, and by dissimilar dental plates.

Type of the genus.—*Cambarincola macrodonta*.

CAMBARINCOLA MACRODONTA, new species.

Type-specimen.—4.65 mm. body length; Cat. No. 53794, U.S.N.M.

Cotypes.—Four specimens, 1 to 4.25 mm. body length; Cat. No. 53794, U.S.N.M.

Body rather slender when extended, slightly arched ventrally, circular in cross section in all regions, greatest diameter in the fifth or

sixth segment, shortest diameter in the first segment, sloping gradually from the fifth segment to the first and rather abruptly from the sixth segment to the acetabulum; greatest diameter of the head always less than the greatest diameter of the body; greatest diameter of the

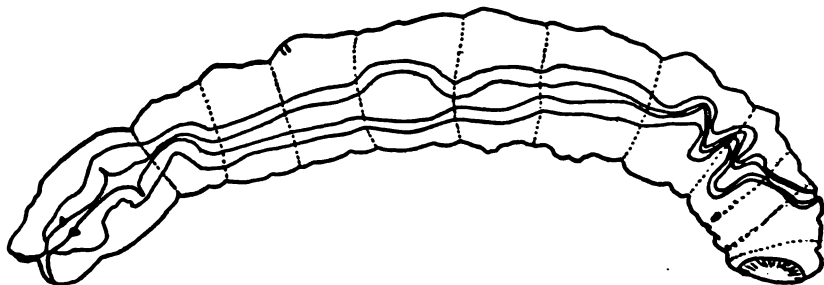


FIG. 1.—CAMBARINCOLA MACRODONTA. OUTLINE SIDE VIEW OF TYPE-SPECIMEN.

body 5 to 8 in the body length; head distinct, elongate in extended specimens; length of the head greater than the greatest diameter of the body in extended specimens (greatest diameter of the body 1.1 to 1.3 in the length of the head), equal to or less than the greatest diameter of the body in contracted individuals (length of the head 1 to 1.3 in the greatest diameter of the body); greatest diameter of the head 1.2 to 1.4 in the greatest diameter of the body.

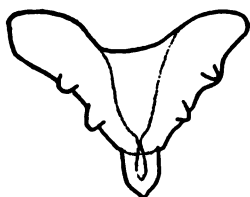


FIG. 2.—CAMBARINCOLA MACRODONTA. DORSAL DENTAL PLATE, FRONT VIEW. FROM A CLEARED PREPARATION.

Head composed of four annulations; the first or anterior cephalic annulation very prominent, of less diameter than the second annulation, tapering forward, from 2.3 to 3.3 in the total length of the head, depending upon the degree of contraction, composed largely of two fleshy lips—a dorsal and a ventral—of which the dorsal is very slightly the longer; the other three annulations very indistinctly marked, so that the remainder of the head appears to be but a single piece; first seven or eight body segments showing a rather distinct biannulation, the anterior portion of each segment being of the greater diameter; acetabulum terminal, of moderate size, from 1 to 1.25 in the greatest diameter of the head; genital papillæ on segments 5 and 6, quite conspicuous in large specimens.

Mouth terminal, or very slightly ventral, its opening rather diamond shaped, with the greatest dimension at right angles to the dorso-ventral line, guarded by two large lips, each of which bears several tiny papillæ on its inner surface and a few minute hairs on its outer edge near the median line; each lip entire with the exception of a single slight emargina-



FIG. 3.—CAMBARINCOLA MACRODONTA. VENTRAL DENTAL PLATE, FRONT VIEW. FROM A CLEARED PREPARATION.

tion in the median line, which may be entirely wanting; dental plates very dark-brown to black, situated at or just in front of the junction of the first and second cephalic annulations; dorsal plate roughly triangular in outline when seen from the front, middle portion of the base excavated so that the two corners extend beyond the rest of the plate as two horns, anterior face with two rather prominent teeth on each side near the edge of the plate, the tooth nearer the apex on each side being pointed and larger than the basal tooth, apex produced into a single large cylindrical tooth with a conical point; ventral plate with an excavated base like that of the dorsal plate, the anterior face bearing a single small knob-shaped tooth on each side near the base, apex produced into two large cylindrical teeth, each with a conical point.

Pharynx narrowing just behind the dental plates, with a distinct dorsal diverticulum near the junction of the second and third cephalic annulations and a ventral diverticulum slightly caudad, the mouths of the two diverticula producing an irregular enlargement of the pharynx in the third annulation; esophagus narrow, occupying the first body segment, near the middle of which it drops to the floor of the body cavity; crop or post-esophageal portion of the alimentary

canal extending through segments 2 and 3, rising gradually to the center of the body, increasing steadily in diameter, caudad, and showing little or no constriction at the junction of segments 2 and 3 unless distended with food; stomach large, almost filling segment 4, marked off by definite constrictions; intestine proceeding as a straight tube of slightly less diameter than that of the stomach through the center of segments 5 and 6; in segment 7 becoming somewhat narrowed, swinging dorsally and to the left side of the body in the anterior portion of the segment, and returning much narrower to the right of the

FIG. 4.—*CAMBARINCOLA MACRODONTA*. RECONSTRUCTION TO SCALE FROM SECTIONS OF THE GENITAL TRACTS OF SEGMENTS 5 AND 6 SEEN FROM THE RIGHT SIDE OF THE ANIMAL. A, SPERMATHECA; B, ACCESSORY SPERM TUBE; C, ANTERIOR PAIR OF VASA DEFERENTIA; D, POSTERIOR PAIR OF VASA DEFERENTIA; E, SPERMATIC VESICLE; F, OPENING OF THE PENIS.

median line in the posterior portion of the segment, leaving segment 7 near the dorsal wall of the body cavity; continuing in the anterior portion of segment 8 much narrower, crossing again to the left side and descending to the center of the segment, enlarging in the posterior portion of the segment, but leaving segment 8 near the center as a small tube; the rectum beginning in segment 9, passing diagonally through

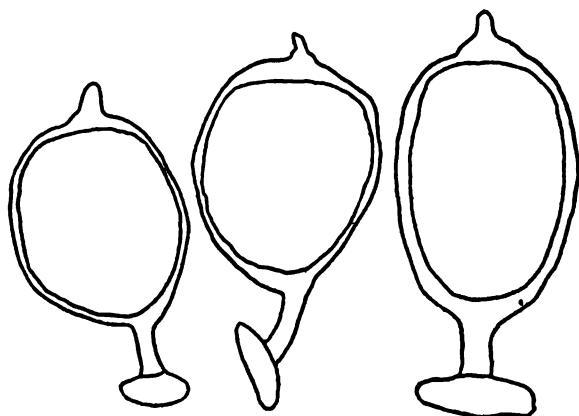


FIG. 5.—CAMBARINCOLA MACRODONTA. THREE COCOONS, SHOWING THE VARIATION AND IRREGULARITIES.

this segment to its dorsal wall, opening dorsally in the median line in the anterior portion of segment 10.

Living animals colorless and quite transparent excepting the alimentary canal (which was a pale green in the specimens observed), and the gonads; body quite contractile.

Cocoons subspherical and borne by a short pedicle; distal portion of the capsule produced into a slender, pointed peak which usually shows a basal enlargement; total length of cocoon and pedicle 0.7 to 0.9 mm.; length of pedicle about 0.14 mm.; length of peak about 0.08 mm.; average width of cocoon 0.3 mm.

Found on almost any part of the exterior of *Cambarus diogenes* Girard, particularly on the ventral surface. No specimens were found in the gill chambers.

This species may be separated from *C. philadelphica* (Leidy), the nearest related species, and its systematic position determined from the following key. Its general anatomy, with the exceptions already made in the description, is practically the same as that of *Bdellodrilus illuminatus* (Moore), which has been elaborately treated by Moore.¹

KEY TO THE KNOWN DISCODRILIDÆ OF THE UNITED STATES EAST OF THE ROCKY MOUNTAINS.

- a¹. Dorsal and ventral dental plates similar; anterior nephridia with separate dorsal openings.....*Branchiobdella* Odier.
- b¹. A pair of cup-shaped organs on the latero-ventral surface of both segments 8 and 9; alimentary canal rather straight.....*B. pulcherrima* Moore.
- b². No cup-shaped organs on segments 8 and 9; alimentary canal much convoluted near its posterior end; posterior half of the body distinctly wider than the anterior half.....*B. instabilis* Moore.

¹ Journ. Morph., vol. 10, 1896, p. 497 et seq.

- a³. Dorsal and ventral dental plates dissimilar; anterior nephridia opening through a common mid-dorsal pore in the center of a small papilla.
- c¹. Spermatheca bifid; dental plates colorless; without sensory hairs about the mouth; oral sensory papillae wanting; nine post-cephalic segments each with a conspicuous pair of large clear glands opening to the exterior dorsally and ventrally; penis eversible. *Bdellodrilus* Moore.
B. illuminatus (Moore).
- c². Spermatheca not bifid; dental plates colored; sensory hairs about the mouth; oral sensory papillae present; no large clear glands in the nine post-cephalic segments; penis not eversible, but bursa eversible. *Cambarincola*, new genus.
- d¹. Head as wide, usually wider than the greatest width of the body, campanulate; lip single, circumoral and slightly crenate; intestine rather straight; dorsal dental plate with 3 small teeth on each side, apical tooth conical; ventral dental plate with 4 small teeth on each side; base of both even.
C. philadelphica (Leidy).
- d². Head elongate, width always less than the greatest width of the body, tapering in the anterior half; lips 2; intestine much convoluted in the last three segments through which it passes; dental plates each with lateral horns; dorsal dental plate with 2 prominent teeth on each side, apical tooth cylindrical and pointed; ventral dental plate with a single pair of knob-shaped teeth, one on each side, the two apical teeth large, cylindrical and pointed; pharynx with a distinct dorsal and a distinct ventral diverticulum.
C. macrodonta, new species.

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Bdellodrilus illuminatus SMALLWOOD, Biol. Bull., vol. 11, No. 2, 1906, p. 100 (Lake Clear, Harriettstown, Franklin Co., New York).

3. *CAMBARINCOLA*, new genus.Type, *Cambarincola macrodonta*, new species.5. *Cambarincola philadelphica* (Leidy).*Astacobdella philadelphica* LEIDY, Proc. Acad. Nat. Sci. Phila., vol. 5, p. 209, and Smiths. Misc. Coll., vol. 46, 1904, No. 177, p. 51 (from *Astacus bartonii*).—

VERRILL, Rept. U. S. Com. Fish., 1872-73, p. 688.

Branchiobdella philadelphica MOORE, Proc. Acad. Nat. Sci. Phila., vol. 45, 1893, p. 427, pl. 12, fig. 4 *a*, *b*, *c*, *d*, *e* (Watauga Co., North Carolina; Philadelphia, Pennsylvania).*Bdellodrilus philadelphicus* MOORE, Journ. Morph., vol. 10, 1895, p. 498.6. *Cambarincola macrodonta*, new species.Boulder, Colorado, from *Cambarus diogenes*.

THE FISHES OF OKINAWA, ONE OF THE RIU KIU ISLANDS.

By JOHN OTTERBEIN SNYDER,
Of Stanford University, California.

This account of the fishes of Okinawa is based on a collection made by members of the United States Bureau of Fisheries steamer *Albatross* at the time of her cruise during 1906 in the north Pacific Ocean and along the shores of Japan. On the arrival of the *Albatross* in Japan, the writer and Mr. Michitaro Sindo, a student of Stanford University, were detached from the vessel and intrusted with a study of the shore fishes. The party visited various points along the coast from Otaru in Hokkaido to Okinawa, one of the Riu Kiu Islands. Five days beginning with August 13 were spent at the latter place, most of the time being consumed in an examination of the tide pools near Naha and Itoman. The market, open for an hour or two each evening, was regularly visited and an attempt made to procure specimens of each species that appeared there.

The excellent results obtained from our short stay at Naha were made possible through the kindly interest of Baron Shigeru Narahara, governor of the Province, the chief and other officers of the police force of Naha, the town officials of Itoman, and the teachers of the fisheries school at the same place.

Okinawa, the largest of the Riu Kiu or Luchu Islands, lies about halfway between Kiu Siu and Formosa, directly in the path of the Kuro Shiwo, the great warm current that passes northward along the eastern shores of Japan. Its climate is hot and humid. The island appears to be a coral formation, no volcanic or sedimentary rocks appearing on the surface. Near the harbor of Naha the coast is fringed with growing coral reefs, and the rocks near shore are conglomerates of disintegrated corals. The outlying reefs, the gently sloping beaches, seamed and carved by the tides, and the intervening region of broken corals and beds of sand and mud offer retreats for vast numbers of fishes and other marine forms.¹

¹ Interesting in this connection is the rather naive account of Bayard Taylor in the narrative of the expedition to Japan under the command of Commodore Perry. In his description of the port of Naha Taylor says: "Here the little pools which seamed the surface were alive with crabs, snails, starfish, sea-

A list of the fishes known from the Riu Kiu Islands, published by Jordan and Starks,¹ records 54 species as occurring at Okinawa. However, this small number, together with a few others from the islands near by, furnished material for the observation that the fish fauna is fully tropical, composed of forms having a wide distribution among the coral islands of Polynesia with some species characteristic of the coasts of southern Japan and China. This conclusion easily stands in the presence of a more thorough study made possible by the collection in the hands of the present writer.

Nearly 60 per cent of the species listed in the present report are characteristic of the East Indies, the Philippines, and Polynesia, about a third of these being known only from Polynesia. Not more than 20 per cent occur in Japan, and most of these are indigenous to the southern coasts, not extending their range north of Misaki. Some of these Japanese species are also found far to the south through the Philippines and Polynesia and also in the East Indies. The remainder includes a few forms which are cosmopolitan, and a considerable number which have thus far been seen only near Okinawa.

It is not presumed that the following list of Okinawa fishes, although recording 293 species,² includes more than a part of the great number occurring there. That the fauna is rich in species is amply shown by the large number obtained in so short a time from the pools and the small market, the great fringe of reefs remaining untouched. The many forms recorded without further note are represented by one or more specimens secured in the market, nothing having been learned during the short stay of the party concerning their relative abundance, habits, distribution, or value as food.

The color notes on fishes from the pools were made from living examples. Those based on market specimens were taken from

prickles, and numerous small fish of the intensest blue color. We found several handsome shells clinging to the coral, but all our efforts to secure one of the fish failed. The tide was ebbing so fast that we were obliged to return for fear of grounding the boat. We hung for some time over the coral banks, enraptured with the beautiful forms and colors exhibited by this wonderful vegetation of the sea. The coral grew in rounded banks, with clear, deep spaces of water between, resembling in miniature ranges of hills covered with autumnal forests. The loveliest tints of blue, violet, pale green, yellow, and white gleamed through the waves, and all the varied forms of vegetable life were grouped together, along the edges of cliffs and precipices, hanging over the chasms worn by currents below. Through these paths, and between the stems of the coral groves, the blue fish shot hither and thither like arrows of the purest lapis lazuli; and others of a dazzling emerald color with tails and fins tipped with gold, eluded our chase like the green bird in the Arabian story. Far down below, in the dusky depth of the waters, we saw, now and then, some large brown fish, hovering stealthily about the entrances to the coral groves, as if lying in wait for their bright little inhabitants. The water was so clear that the eye was deceived as to its depth, and we seemed now to be resting on the branching tops of some climbing forest, now to hang suspended in midair between the crests of two opposing ones. Of all the wonders of the sea which have furnished food for poetry and fable this was assuredly the most beautiful."

¹ Proc. U. S. Nat. Mus., vol. 32, 1907, p. 491-501.

² Species previously recorded from Okinawa and not represented in the *Albatross* collection are included in footnotes.

individuals just dead, they having been transferred at once from the live wells of the boats to the place of sale.

Descriptions of the new species have been published in previous volumes of these Proceedings.

The drawings were made by Mr. W. S. Atkinson.

The writer acknowledges with pleasure his obligations to Dr. David Starr Jordan for assistance in matters pertaining to nomenclature, and to Dr. C. H. Gilbert, who, as naturalist in charge of the *Albatross* expedition, made this study possible.

Family SCYLIORHINIDÆ.

STEGOSTOMA TIGRINUM (Gmelin).

One small specimen, with the yolk sack attached, was seen in the collection of the fisheries school at Itoman near Naha.

Family ÆTOBATIDÆ.

ÆTOBATIS TOBIJEI (Bleeker).

Family ELOPIDÆ.

ELOPS HAWAIENSIS Regan.

One specimen agrees almost perfectly with examples from Hawaii. Vertebrae, 68; scales, 94; interorbital space, 5.5 in head; pectoral, 2; gillrakers, 14; lower jaw included. This represents the *E. machnata* of Temminck and Schlegel, and it is probable that no other form occurs in Japan or the Riu Kiu Islands. Many were seen in the markets.

MEGALOPS CYPRINOIDES (Broussonet).

Family CLUPEIDÆ.

CLUPEA OKINAWENSIS Kishinouye.

Small specimens were seined in shallow water near shore.

Family SYNODONTIDÆ.¹

SYNODUS JAPONICUS (Houttuyn).

SAURIDA ARGYROPHANES (Richardson).

SAURIDA GRACILIS (Quoy and Gaimard).

Family PLOTOSIDÆ.

PLOTOSUS ANGUILLARIS (Bloch).

Seined in shallow water near the shore.

¹ Family CHANIDÆ.
Chanos chanos (Forakai).

Family LEPTOCEPHALIDÆ.

LEPTOCEPHALUS MARGINATUS (Valenciennes).

Many were seen in the market. One small example has the pectoral blotch scarcely visible.

Family MYRIDÆ.

MURÆNICHTHYS OWSTONI Jordan and Snyder.

In several small examples from the pools the snout is slightly more pointed than in the type-specimen. The slit of the posterior nostril divides the lip just anterior to the eye.

Family OPHICHTHYIDÆ.¹

MICRODONOPHIS POLYOPHTHALMUS (Bleeker).

An eel from the market is identified as a specimen of this species, although it does not agree in color with the example figured by Bleeker.² Color in life, brownish gray, white beneath, the snout and tail yellow; body with ocelli which are gray within tinged with lavender, the borders dark brown, surrounded with reddish orange which fades off into the body color; ventrally the ocelli become brown spots surrounded with orange; ocelli of head lemon yellow within, the margins brown, growing lighter on sides of head, yellow beneath; nostril tubes orange.

PISOODONOPHIS CANCRIVORUS (Richardson).

An example measuring 600 millimeters, from the Naha market, does not differ from a larger specimen from Manila.

MYRICHTHYS RUPESTRIS, new species.

A small eel representing a species of *Myrichthys* that appears to be undescribed was obtained at Okinawa by Capt. Alan Owston.

Head 15.5 in length; 5.5 in trunk; head and trunk 1.3 in tail; depth in region of vent 3 in head; eye 8.5 in head; snout 5; cleft of mouth 3.5; length pectoral 7.5; pectoral rays 14.

The body is very elongate and snakelike, the depth being greatest in the pectoral region, decreasing immediately behind it and remaining about the same (3 in head), to the posterior third of caudal where the tail gradually tapers to a rather sharp point. The body is not quite cylindrical, the depth being somewhat greater than the width. Snout elongate, not very blunt, overhanging the lower jaw so that the teeth may be seen from below. Cleft of mouth extending considerably beyond eye. Labial nostrils large, overhanging and

¹ Family MONOPTERIDÆ.

Monopterus albus (Zuiew).

Microdonophis erabo Jordan and Snyder.

² Atl. Ichth. Muræn., pl. 42, fig. 3.

concealing tip of lower jaw when viewed from the side. Gill-cleft wider than eye, narrower than length of snout, below middle of head, and oblique in position. Teeth blunt; in 2 series on jaws, vomer and palatines. Dorsal fin originating on occiput halfway between tip of snout and gill-opening, increasing in height to near middle of body where it measures 1 in the snout, 5 in the head. Caudal originating immediately behind anal opening and extending to near tip of tail where it disappears at a point below end of dorsal, the portion of tail without fins being equal in length to the snout. Base of pectoral equal in length to gill-opening; rays of fin branched, the middle ones longest.

Color in spirits: Body tinted with brown above, lighter below; body and tail with 3 series of rounded or elongate dark brown spots; the upper series lying along the dorsal fin, many of the spots being cut by the base of it, those of each side alternating in position; median series 25 in number, extending along side of body and tail, alternating in position with those of upper and lower series; ventral series small and somewhat irregular on the trunk, larger and more regular on the tail, where they are arranged along the base of anal alternating in position with those of the opposite side; tip of tail light; dorsal fin with dark spots each of which corresponds in position with one on the body at base of fin, there being about twice as many spots on the fin as on either side of body at its base; pectorals and anal immaculate; head with a large oval spot above gill-opening, a much smaller one above and behind eye, and another halfway between these; small spots below eye and on chin and throat; tip of snout immaculate.

This species closely resembles *M. tigrinis* of the Central American coast. It is colored much like this form, and the body has the same nearly cylindrical shape, but it is a great deal more slender, specimens of *M. tigrinis* of equal length being almost twice as deep and having very much larger heads. The snout is more obtuse in *M. rupestris*.

M. magnificus of Hawaii has a shorter and deeper body which is compressed rather than cylindrical, a longer snout, and from 20 to 22 spots in the lateral row. Three specimens of this species were lately collected by the writer in the tide pools near Honolulu, the first to be seen since the species was discovered in 1835. These specimens, which were carefully preserved, agree with the original description except in the following particulars. The body is decidedly compressed, rather than cylindrical; the very small pectoral fin has 11 instead of 20 rays, the tips having no doubt been counted thus enumerating the branches; the teeth are not acute, but on the contrary have rounded points. The color which has changed very little from that of life is almost exactly as originally described, the dorsal however being spotted much like that of *M. rupestris*.

The following table records some measurements of the Okinawan and the Hawaiian specimens:

	<i>Myrichthys</i> <i>respestris</i> .		<i>Myrichthys magnificus</i> .	
Total length in millimeters.....	415	400	312	286
Head in length.....	.082	.067	.072	.07
Depth.....	.02	.035	.03	.032
Depth head.....	.028	.03	.032	.031
Length body, including head.....	.042	.042	.043	.043
Length snout.....	.011	.015	.016	.015
Diameter eye.....	.006	.005	.007	.007
Cleft of mouth.....	.016	.018	.017	.016
Width of gill-opening.....	.01	.01	.007	.01
Snout to origin of dorsal.....	.04	.034	.05	.04
Height dorsal.....	.011	.015	.016	.015
Height anal.....	.009	.007	.01	.01
Length pectoral.....	.01	.008	.01	.01

Type-specimen—Cat. No. 74048, U. S. Nat. Mus.

Family MURÆNIDÆ.¹

GYMNOTHORAX MELEAGRIS (Shaw).

GYMNOTHORAX LAYSANUS (Steindachner).

A specimen 390 millimeters long from a tide pool near Naha is almost exactly like an example from Hawaii. The head and body are closely covered with white spots which grow larger and fewer posteriorly. These white spots are on a brownish background which has numerous black spots about as large as the eye.

GYMNOTHORAX PICTUS (Ahl).

Finely clouded with brown and yellowish gray in life, the color soon fading after death to pale brownish gray and white.

GYMNOTHORAX UNDULATUS (Lacépède).

GYMNOTHORAX PETELLI (Bleeker).

GYMNOTHORAX STELLATUS (Lacépède).

Three specimens, one of which is like several collected at Samoa by Doctor Jordan. The spots are about the size of the eye and are scattered over the body, only the upper ones tending to arrange themselves in a row. Another has the spots larger and not arranged in rows. It is possible that both the Okinawa and Samoa specimens are representatives of *M. fimbriatus* Bennett, figured and described by Bleeker as *G. isingleenoides*.²

GYMNOTHORAX ALBIMARGINATUS (Temminck and Schlegel).

In life, brownish gray, darker posteriorly, the fins growing more dark toward the edges where they are narrowly bordered with dead white; anterior portion of body finely reticulated with pale yellowish-gray lines; snout and region about jaws tinged with salmon red; iris reddish orange.

¹ *Uropterygius okinawa* (Jordan and Snyder).

² Atl. Ichth. Muraen. p. 91, pl. 35, fig. 1.

Head 3.5 in trunk; 4 in tail; snout 6 in head; eye 1.7 in snout. Teeth uniserial, growing gradually smaller from before backwards; no enlarged canines; some teeth depressible, others apparently embedded in the jaw. Diameter of gill-opening about equal to that of eye.

The above description is of a specimen 900 millimeters long. Another, 320 millimeters long, had life colors similar to the above, but differed as follows; head 2.5 in trunk; 4 in tail; snout 5.5 in head; eye 2 in snout; teeth biserial.

GYMNOTHORAX PHILIPPINUS Jordan and Seale.

One specimen, the second of this species that has been recorded, was obtained in the Naha market. It resembles the type very closely.

Suspecting that this species might be synonymous with *Muraena reevesi* Richardson,¹ which Günther records from Japan, the writer asked Mr. Henry W. Fowler to compare Richardson's description and figure with that of Jordan and Seale. Mr. Fowler writes: "Although apparently very closely related, I should be inclined to consider the two species provisionally distinct. *M. reevesi* has the spots on the dorsal and anal large and rather sparse, similar to those on the trunk, and arranged in two irregular series, one marginal and the other basal. There are no median, smaller ones as in *G. philippinus*. *M. reevesi* has the gill-opening distinctly black. There are also 5 large, dusky blotches between eye and gill-opening, and a small, dark one just over gill-opening. *M. reevesi* further displays a large dark blotch on ramus of mandible near its articulation, and the thorax and abdomen are rather obscurely mottled."

GYMNOTHORAX CHLAMYDATUS Snyder.

Plate 62, fig. 1.

Gymnothorax chlamydatus SNYDER, Proc. U. S. Nat. Mus., vol. 35, 1909, p. 94.

Two specimens of this remarkably beautiful eel were secured in the market at Naha.

ECHIDNA NEBULOSA (Ahl).

ECHIDNA KISHINOUEI Jordan and Snyder.

The writer can not follow Jordan and Seale in identifying this species with *E. delicatula* (Kaup) if the species described by Bleeker² is identical with that represented by Kaup's specimen. The type of *E. kishinouei* came from Okinawa. A second specimen from the Naha market does not differ from the type. These have the body, including the head, much shorter than the tail, and they differ in other particulars from *E. delicatula* as will appear when Bleeker's description is compared with the following:

Head 3 in trunk, 10 in total length; head and trunk 1.5 in tail; eye 14 in head; snout 7. Dorsal inserted midway between gill opening

¹ Voy. Suipéur., 1848, p. 109, pl. 49, fig. 2.

² Atl. Ichth. Muræen., p. 78, pl. 23, fig. 3.

and tip of snout. Mouth small, the eye on a vertical passing midway between tip of snout and angle of mouth. In the upper jaw the teeth are in a single series anteriorly, in 3 series posteriorly; all bluntly pointed, the anterior ones very heavy and slightly curved backwards, the posterior ones somewhat more slender; anterior part of jaw with 2 or more rather large median teeth behind which is a vomerine series, forked in front. Teeth of lower jaw heavy and rather blunt, in 2 series laterally, but increasing in number and forming a cluster at the symphysis. Body gray, mottled and spotted with brown, the head on anterior half plain brown; gill opening with a brown spot. The type is much faded and therefore lighter, the markings being less distinct. The fins are like the body, the tip of the tail dark. The length of the specimen here described is 145 millimeters.

ECHIDNA POLYZONA (Richardson).

A specimen from the tide pools, 130 millimeters long, was brownish black in life with narrow bars of yellowish white.

Family **BELONIDÆ**.

TYLOSURUS GIGANTEUS (Temminck and Schlegel).

Family **EXOCETIDÆ**.¹

HEMIRAMPHUS, *sp.*

Some badly damaged specimens from the market that closely resemble *H. pacificus*, may possibly belong to that species.

HEMIRAMPHUS COMMERSONI Cuvier.

One specimen 380 millimeters long from the market has the fourth spot of the body located below the middle of the dorsal fin. A fifth faintly outlined spot is below the posterior part of the dorsal. There extends along the dorsal part of the body a conspicuous stripe which, below the dorsal fin, is equal in width to one scale. Anteriorly the stripe broadens toward the pectoral; posteriorly it narrows on the caudal peduncle and then abruptly widens on the base of the caudal fin. The dorsal part of the stripe is steel blue, the ventral part silvery. The dorsal has 12 rays, the anal 10. There are 50 scales in a lateral series.

PAREXOCETUS BRACHYPTERUS (Sealand).

Family **FISTULARIIDÆ**.

FISTULARIA PETIMBA Lacépède.

FISTULARIA SERRATA Cuvier.

Family **SYNGNATHIDÆ**.

CORYTHOICETHYS ISHIGAKIUS (Jordan and Snyder).

Nine specimens were taken in the tide pools. The length of the snout usually equals that of the rest of the head, but in some examples

¹ *Hemiramphus dussumieri* (Cuvier and Valenciennes).

Hemiramphus japonicus Brevoort (sive Tanaka).

it is slightly less while in others it is considerably more. In some individuals the dark throat bars are little developed or even absent.

The writer is unable to find any characters that will distinguish the recently described *C. waiti* or *C. elerae* from this species.

MICROPHIS EXTENSUS Snyder.

Plate 62, fig. 2.

Microphis extensus SNYDER, Proc. U. S. Nat. Mus., vol. 40, 1912, p. 525.

Pools at Naha.

ICHTHYOCAMPUS NOX Snyder.

Plate 62, fig. 3.

Ichthyocampus nox SNYDER, Proc. U. S. Nat. Mus., vol. 36, 1909, p. 598.

One specimen, a female, from a pool at Naha.

MICROPHIS OCELLATUS Snyder.

Plate 63, fig. 1.

Microphis ocellatus SNYDER, Proc. U. S. Nat. Mus., vol. 36, 1909, p. 598.

Pools at Naha.

Family MUGILIDÆ.

MUGIL CEPHALUS Linnaeus.

LIZA TROSCHLI (Bleeker).

Family SPHYRAENIDÆ.

SPHYRÆNA OBTUSATA Cuvier and Valenciennes.

Two specimens from the market agree in appearance with one figured by Günther in his *Fische der Südsee*.

SPHYRÆNA COMMERSONI Cuvier and Valenciennes.

Family POLYNEMIDÆ.

POLYDACTYLUS AGONASI Jordan and McGregor.

Family HOLOCENTRIDÆ.¹

MYRIPRISTIS INTERMEDIUS (Günther).

One specimen about 230 millimeters long, from the market, has the tip of the dorsal lightly touched with dusky color, and a mere trace of black on the anal. Both the soft dorsal and anal are narrowly edged with white.

MYRIPRISTIS MACROLEPIS Bleeker.

An individual from the market agrees closely with Bleeker's figure except in color. It has in addition to the dark border of the opercular membrane, a black tipped dorsal, anal, and caudal. The scales of the back are narrowly edged with dusky color. It is like a specimen

¹ Family Atherinidæ.

Atherina woodwardi (Jordan and Starks).

Holocentrus itodes (Jordan and Fowler).

Holocentrus prasinus (Lacépède).

from Bacon, Philippine Islands, except that the latter has immaculate fins. This species may be distinguished from *M. adustus* by its more rounded head and less conical snout.

HOLOCENTRUS SAMMARA (Forskål).

One specimen from the market. The soft dorsal is narrowly edged with dusky color. The third anal spine and the first ray are dark.

HOLOCENTRUS BINOTATUS Quoy and Gaimard.

Two examples measuring about 280 millimeters, from the market, agree with Samoan specimens except that they have no dark marks on the dorsal membrane.

HOLOCENTRUS RUBER (Forskål).

A specimen 210 millimeters long, purchased in the market, is in every particular like the figure of *H. melanospilus* of Bleeker.¹ It has a somewhat more elongate snout and longer and more pointed ventrals than an example from Hongkong figured by Jordan and Seale.² The spot at the bases of the dorsal, anal, and caudal are very conspicuous on the Okinawa specimen.

HOLOCENTRUS PUNCTATISSIMUS Cuvier and Valenciennes.

One small example from the pools.

Family **SCOMBRIDÆ**.

EUTHYNNUS ALLETERATUS (Rafinesque).

A specimen from the market, with 6 spots below the corset, has been identified as *E. alleteratus* without direct comparison with specimens from elsewhere.

Family **CARANGIDÆ**.³

SCOMBEROIDES SANCTIPETRI Cuvier and Valenciennes.

TRACHUOPS CRUMENOPHITRALMA (Bloch).

CARANX JARRA Cuvier and Valenciennes.

CARANX IGNOBILIS (Forskål).

CARANX FORSTERI Cuvier and Valenciennes.

ALLECTIS CILIARIS (Bloch).

Differs from *A. major* in the heavier body, broader interorbital space, and darker colored dorsal area.

Family **TRICHIURIDÆ**.

TRICHIURUS HAUMELA (Forskål).

There are 2 orange stripes along the sides, the lower bordering the lateral line.

¹ Atl. Ichth., Muren, pl. 359, fig. 1.

² Proc. Davenport Acad. Sci., vol. 10, p. 5, pl. 2.

³ *Trachinotus baillonii* (Lacépède).

Seriola quinqueradiata (Temminck and Schlegel).

Family PEMPHERIDÆ.

PEMPHERIS JAPONICUS Döderlein.

PEMPHERIS OVALENSIS Cuvier and Valenciennes.

Family CHILODIPTERIDÆ.

AMIA NOVEMFASCIATA (Cuvier and Valenciennes).

This species is abundantly represented in the pools. In life the body above the median stripe has a distinctly bluish sheen, while below it is reddish; stripes brassy, the two dorsal ones tinged with olive; edge of opercle bluish; iris brassy; spinous dorsal suffused with dark orange, other fins with light red, the soft dorsal having a brassy bar.

AMIA SAVATENSIS (Günther).

Small specimens were occasionally seen in the tide pools.

AMIA LATERALIS (Valenciennes).

Market. Four individuals measuring about 65 millimeters, show traces of a short stripe above the median one.

AMIA ERYTHRINA (Snyder).

Apparently rare, but one example having been seen in the pools.

APOGONICHTHYS NAFÆ Snyder.

Plate 63, fig. 2.

Apogonichthys nafx, SNYDER, Proc. U. S. Nat. Mus., vol. 36, 1909, p. 599.

Naha pools.

Family KUHLIIDÆ.

SAFOLE TÆNIURA (Cuvier and Valenciennes).

Family SERRANIDÆ.¹

VARIOLA LOUTI (Forssk.).

Of two specimens secured in the market, the larger, measuring 330 millimeters in length, was colored as follows: Yellowish olive above, shading into salmon red beneath, each scale with a darker center; head, body, and fins with spots which are cerulean blue on the upper parts, reddish on the sides, and decidedly red beneath, each spot with a narrow, dark blue margin; posterior border of dorsal, anal, caudal, and pectorals with a broad margin of orange, the terminal margin of the pectoral bordered proximally with bluish gray; outer edges of ventrals reddish brown, the inner edges orange. In alcohol the color is dark, the dorsal spots bluish gray, the ventrals white; fins with the posterior edges white. The smaller example, 150 millimeters in length, is almost devoid of color, the light borders of the spots and fins being scarcely distinguishable in consequence.

¹ *Eptacphelus merra* (Bloch).

Centropomus walpolei (Quoy and Gaimard).

VARIOLA FLAVIMARGINATA (Rüppell).**CEPHALOPHOLIS URODELUS (Forster).**

Several specimens from the market show a considerable amount of variation in color. Two are almost black, except for light, convergent caudal stripes which are separated by jet black areas. A third specimen has only the tail and caudal fin of a dusky hue, while a fourth is almost entirely without dark color, the caudal stripes being very faint. The darkest example has a dusky opercular spot, and all have black-edged ventrals.

One small specimen was taken in a tide pool.

CEPHALOPHALUS SONNERATI (Cuvier and Valenciennes).

One example from the market measures 300 millimeters in length. The second anal spine is slightly shorter and heavier than the third. The fins, except the pectorals, have narrow dusky borders, the dorsal, anal, and caudal being edged with white.

EPINEPHELUS MEGACHIR (Richardson).

Many were seen in the market, and a few were taken in the pools.

EPINEPHELUS STELLATUS (Richardson).

Collected from both the market and pools.

EPINEPHELUS TSIRIMENARA (Temminck and Schlegel).

Market specimens were light crimson, each scale with a lighter center; spinous dorsal with a black margin, the other fins with yellowish margins.

EPINEPHELUS TAUVINA (Forsk.)**EPINEPHELUS CÆRULEOPUNCTATUS (Bloch).**

One small example from a tide pool.

EPINEPHELUS SUMMANA (Forsk.)

One very dark specimen, the light spots of the body being very indistinct, while those of the fins are more prominent.

EPINEPHELUS RHYNCHOLEPIS Bleeker.

Small, pearly spots, prominent in examples from the market, have almost entirely disappeared in the preserved specimens.

PLESIOPS MELAS (Bleeker).

This species is abundantly represented in the pools. In life the body is deep brownish black, the color a little lighter on basal parts of scales; iris blue and gold; dorsal spines tipped with bright reddish orange, a narrow, purple stripe extending along middle of fin, the membrane of soft dorsal dark yellowish gray below the stripe; pectoral tinged with yellow; anal with an indistinct, narrow, pearly blue stripe passing diagonally from base of first spine to tip of last ray. In alcohol the specimen here described has become brownish black, the spinous dorsal being tipped with white.

Family LUTIANIDÆ.¹**LUTIANUS KASMIRA** (Forsk.).

Two specimens from the market, 70 millimeters long, have the oblique stripes rather faintly outlined, while a conspicuous, dark spot appears below the origin of the soft dorsal, and between the stripes which pass backward from the eye. One large example has the stripes well defined and the spot scarcely discernible.

LUTIANUS RIVULATUS (Cuvier and Valenciennes).

Some market specimens about 80 millimeters long are presumed to be young individuals of this species. They have a well-defined dark bar extending from the base of the pectoral to the origin of the dorsal, behind which are one or two indistinctly outlined or scarcely visible bars. A white spot on the lateral line is bordered anteriorly and posteriorly by a dark spot. There are narrow, dark bars across the interorbital space.

LUTIANUS QUINQUELINEATUS (Bloch).**LUTIANUS ARGENTIMACULATUS** (Forsk.).**LUTIANUS VITTA** (Quoy and Gaimard).

Color of a fresh market specimen, grayish olive, slightly darker above the lateral line where the body color becomes decidedly tinged with yellow posteriorly; lighter below lateral line, the ventral surface suffused with light red; many oblique, yellow stripes above lateral line; each scale below lateral line with a narrow, greenish white stripe; those on ventral surface pearly; between the narrow stripes are broader ones of pale orange; head grayish olive above, the sides strongly tinged with lavender; maxillary, edge of lower jaw and lower edge of preopercle margined with yellow; chin, throat, and branchiostegal region dead white; dorsal fins tinged with yellowish olive and edged with orange; pectorals and ventrals suffused with orange; spot below origin of soft dorsal brownish black; a pale, scarcely visible dark stripe passing from snout through eye toward dark spot.

LUTIANUS MONOSTIGMA (Cuvier and Valenciennes).**APRION VIRESCENS** (Cuvier and Valenciennes).**PLATTINIUS AMÆNUS** Snyder.

Plate 63, figure 3.

Platinius amænus SNYDER, Proc. U. S. Nat. Mus., vol. 40, 1912, p. 530.

Family HÆMULIDÆ.

CÆSIO ERYTHROGASTER Cuvier and Valenciennes.**CÆSIO CÆRULAUREUS** (Lacépède).**CÆSIO CHRYSOZONUS** Kuhl and Van Hasselt.

Color of a market specimen, deep purple above, becoming bluish on the sides; ventral surface pearly blue, each scale with an indistinct

¹ *Lutianus marginatus* (Cuvier and Valenciennes).

Lutianus unimaculatus (Bloch).

reddish spot; chin and throat suffused with bright red; two narrow, bright orange stripes on the dorso-lateral surface; fins strongly suffused with pink; caudal lobes tipped with black; axil of pectoral black.

TERAPON JARBUA (Forakii).

PLECTORHYNCHUS DIAGRAMMA (Lacépède).

Of two specimens procured in the market, one has the membrane of the spinous dorsal black, the soft dorsal with two rows of round black spots and a black edge, the caudal with large, round black spots and a black edge, the anal similar, and the pectorals dusky. The other has the dorsals and anal narrowly edged with black, the spinous dorsal with a median row of black spots, the soft dorsal with oblique, dark bars which tend to break up into spots, the caudal and anal with black spots, and the pectoral dusky. The edges of the ventrals in each case are broadly bordered by dusky color on the upper surface, the membranes of the fins being dead white between the rays.

PLECTORHYNCHUS CHÆTODONTOIDES (Lacépède).

In a fresh market specimen the spots of the body are deep brown, the interspaces light yellowish gray; ventral parts gray, with pearly reflections; fins tinged with pearly blue; lips white, the membrane behind upper lip bright red; inside of mouth clouded with red.

POMADASIS ARGENTEUS (Lacépède).

POMADASIS HASTA (Bloch).

Rows of small, dusky spots along the sides above the median line, which do not tend to form vertical bars or series.

SCOLOPSIS CANCELLATA Cuvier and Valenciennes).

SCOLOPSIS BILINEATA (Bloch).

Bloch says: "Le Japon produit ce poisson", and the finding of 3 examples in the Naha market tends to support the statement.

PENTAPUS MICRODON (Bleeker).

One specimen from the market agrees with Bleeker's figure and description.

PENTAPUS FORMOSULUS Snyder.

Plate 64, fig. 1.

Pentapus formosulus SNYDER, Proc. U. S. Nat. Mus., vol. 40, 1912, p. 531.

There are 48 scales in the lateral series.

GNATHODENTEX AUROLINEATUS (Lacépède).

Family SPARIDÆ.

LETHRINUS HARAK (Forakii).

LETHRINUS RICHARDSONI Günther.

LETHRINUS AMBOINENSIS Bleeker.

LETHRINUS MOENSI Bleeker.

PAGRUS CARDINALIS (Lacépède).

SPARUS SCHLEGELI (Bleeker).

Family KYPHOSIDÆ.

GIRELLA MEZINA Jordan and Starks.

Two specimens from the market and one from a tide pool. The vertical band is scarcely visible on one and entirely absent from another, the smallest one, which measures about 500 millimeters in length.

Family GERRIDÆ.

GERRES FILAMENTOSUS Cuvier and Valenciennes.

Family OPLEGNATHIDÆ.

OPLEGNATHUS FASCIATUS (Temminck and Schlegel).

Three specimens from the tide pools.

Family MULLIDÆ.

UPENEUS MOANA Jordan and Seale.

In some examples the color is very pale, only the two posterior dark saddles appearing distinctly, the others being barely suggested.

UPENEUS BARBERINUS (Lacépède).*UPENEUS BARBERINOIDES* Bleeker.

In 3 specimens the dusky color of the sides extends well on to the ventral surface, the pectoral has a conspicuous splash of dusky at its base, and the lower caudal lobe is broadly bordered with blackish.

UPENEUS PLEUROTÆNIA (Playfair).

A single specimen obtained in the Naha market is certainly a representative of this species, agreeing perfectly with the description of Playfair.¹

The head is contained 3.4 times in the length; depth equal to length of head; eye 2 in snout, 4.5 in head; scales in lateral line 29; between lateral line and dorsal 2; between lateral line and base of anal 6. The barbels reach a vertical through posterior edge of preopercle. Gill-rakers about 6-22, those of lower arch long and slender. The dorsal spines and rays are not filamentous, the spinous dorsal when depressed falling far short of the base of soft dorsal.

In life, the scales of the upper parts are narrowly margined with olive, while ventrally the marginal color fades and becomes tinged with red; there is a white saddle across caudal peduncle at base of soft dorsal; sides with three white stripes, the first or upper extending from eye in almost a straight line to end of soft dorsal fin, the second from tip of snout through lower edge of eye to light saddle on caudal peduncle, the third may be traced for a short distance along the row of scales below the latter; barbels yellow; spinous dorsal clouded with greenish yellow and white, pinkish toward the edge; soft dorsal and

¹ Fishes of Zanzibar, p. 41, fig. 3, not 4, the reference numbers evidently having been interchanged.

anal yellowish with pearly white spots; pectorals, ventrals, and caudal suffused with pink.

In spirits the posterior light saddle and the two upper stripes remain perfectly distinct.

UPENEUS CYCLOSTOMUS (Lacépède).

UPENEUS CHRYSERYDROS (Lacépède).

UPENEUS PLEUROSPILOS Bleeker.

Three examples of this species were secured. The black lateral spot does not seem to be a constant character, perhaps disappearing with age. It is distinct in a specimen 150 millimeters long, scarcely visible in one 240, and entirely absent in a larger example.

Head 3.5 in length to base of dorsal; depth, 3.5; depth caudal peduncle, 9.2; eye, 4.7 in head; width, interorbital space, 3.5; length snout, 1.9; maxillary, 2.4; D. VIII, 9; A. 7; scales in lateral line 29.

Body rather deep, the contour rising gradually from tip of snout to origin of spinous dorsal. Eye nearer border of opercle than tip of snout a distance equal to its diameter. Interorbital space high and strongly convex, this character becoming more pronounced with age. Maxillary not reaching a vertical through anterior edge of orbit, its upper edge fitting beneath edge of preorbital, the posterior edge rounded. Barbels reaching a vertical through edge of opercle. Gill-rakers 6-17; those on lower arch long and slender. Teeth in a single series on jaws, strong and rather short. Scales weakly ctenoid. First dorsal spine minute, the third longest, 1.5 in head; spines when depressed not reaching base of second dorsal. Second dorsal low, the longest (second) ray about equal to depth of caudal peduncle; anal slightly higher. Caudal deeply forked, 1.2 in head; pectorals 1.4; ventrals 1.4.

Color in spirits: Opercle dark, the dusky lining of the inside showing through; a faint dark spot below lateral line at a point beneath posterior portion of spinous dorsal; absent on large individuals; scales of upper part of body narrowly edged with darker, the center having a somewhat lighter area.

UPENEUS INDICUS (Shaw).

Color in life: Body above lateral line suffused with purple, slightly greenish gray below, the light spot between the dorsals with a brassy sheen; scales on upper parts narrowly edged with yellowish olive, the color fading and almost disappearing ventrally; each scale of lower parts with a pale brassy spot on its posterior edge; caudal peduncle with narrow yellowish stripes in region of the black spot, the body color here being almost white; head colored like the body; a pearly blue stripe from tip of snout to lower margin of eye; snout with vermiculations of same color; vermiculations and line followed by narrow yellow stripes; barbels white; spinous dorsal pinkish, the membrane anterior to each spine greenish yellow, soft dorsal pinkish

with greenish yellow oblique bars; anal pearly white with oblique yellow bars; caudal reddish, the membranes suffused with greenish yellow; pectorals suffused with cherry red.

UPENEUS PLEUROSIGMA (Bennett).

Color in life: Bright red above growing lighter and tinged with red on the sides; white beneath; head reddish above, the sides with bluish reflections, purple stripes extending forward from eye; barbels tinged with pink; spines of dorsal red, the membranes suffused with yellowish red; soft dorsal reddish on basal half, the upper part with yellow and pearly stripes, the latter bordered with reddish; upper and lower lobes of caudal red, the middle rays bright yellow; anal pale pearly blue, with yellow stripes.

MULLOIDES FLAVOLINEATUS (Lacépède).

A single specimen 290 millimeters long is referred to this species.

Head 3.5 in the length; depth 3.8; snout 2.2 in the head; eye 4.2; scales in lateral line 39, the pores with many branches; gill-rakers 7-20 on first arch, the longest not equal in length to diameter of pupil; barbels reaching to below posterior border of opercle; dorsal spines 7; 4 scales between tips of depressed spines and base of soft dorsal; 8 dorsal and 6 anal rays.

In life the head and body were strongly suffused with pearly blue above the lateral line, pink below; a dark lemon yellow stripe extended from eye to caudal fin, crossing the lateral line at a point below last dorsal ray; each scale above stripe bordered by yellowish olive, below with deep pink; head reddish, darker above; iris silvery, a conspicuous red ring around pupil; barbels whitish; pectorals suffused with reddish, the other fins bright yellow.

UPENEOIDES BENSASI (Temminck and Schlegel).

This species, somewhat resembling *U. vittatus* in its color pattern, may be distinguished by the long first dorsal spine.

UPENEOIDES TRAGULUS (Richardson).

In life, greenish gray, lighter below; a broad brown lateral stripe extending from eye to caudal fin, below which the head and body are spotted with brown; barbels orange; spinous dorsal clouded with brown, purple and lemon yellow; soft dorsal spotted with reddish brown, the membrane suffused with yellow; caudal lightly washed with yellow, barred with brownish black; ventrals and anal tinged with yellow and spotted with pale purplish brown; pectoral yellowish, spotted with reddish brown.

UPENEOIDES VITTATUS (Forsskal).

Color in life, silvery, the upper parts with a pale greenish sheen, the ventral surface pale yellow; sides with 4 metallic stripes, the upper 2 dark copper colored, the next lower brassy, and the lowest

somewhat lighter; spinous dorsal edged with black, the median portion with 2 dead white bars between which is one of brassy; soft dorsal without black, but otherwise colored as the spinous portion; caudal with black bars having a brassy sheen; ventrals and anal dead white, tinged with yellow; pectorals transparent; barbels white.

Family POMACENTRIDÆ.

AMPHIRIPRION FRENATUS Brevoort.

In life the color is brilliant red tinged with orange, deeper on the snout, lighter posteriorly; tips of soft dorsal, caudal and anal deep orange; bar of head cerulean blue, bordered by deeper blue, the whole edged with brownish black, the dark color spreading anteriorly and posteriorly into a cloud which extends from eye to end of spinous dorsal; pectoral light reddish orange; ventrals similar, the spine brownish black.

POMACENTRUS NIGRICANS Lacépède.

POMACENTRUS MELANOPTERUS Bleeker.

POMACENTRUS DORSALIS Gill.

The synonymy adopted by Jordan and Snyder¹ for a species, *P. dorsalis*, described by Gill,² may also include *P. delurus* Jordan and Seale.³ Several specimens agreeing almost perfectly with Dr. Theodore Gill's description and also with a cotype of *P. delurus* were collected in the pools at Naha. The spot at base of pectoral mentioned by Gill is scarcely discernible and the posterior bluish spots are faint. The cotype of *P. delurus* has 15 rays in the dorsal, the spot on the soft dorsal is not ocellate, but has only a light border anteriorly; the scales in the lateral line number 25 or 26.

ABUDEFDUF SORDIDUS (Forsk.)

Common in the pools.

ABUDEFDUF RICHARDSONI Snyder.

Plate 64, fig. 2.

Abudefduf richardsoni SNYDER, Proc. U. S. Nat. Mus., vol. 36, 1909, p. 600.

Pools near Naha.

ABUDEFDUF REX Snyder.

Plate 64, fig. 3.

Abudefduf rex SNYDER, Proc. U. S. Nat. Mus., vol. 36, 1909, p. 601.

Tide pools, Naha.

¹ Proc. U. S. Nat. Mus., vol. 24, 1902, p. 604.

² Proc. Acad. Nat. Sci., Phila., 1859, p. 147.

³ Proc. U. S. Nat. Mus., vol. 28, 1906, p. 783.

ABUDEFDUF ZONATUS (Cuvier and Valenciennes).

Apparently rather rare in the pools. Brownish black in life, with a bluish white bar across median part of body; scales posterior to bar with purple centers, those anterior being similar but lighter; fins slightly tinged with olive; a small black spot on upper edge of base of pectoral. Small examples (400 millimeters long) have a black ocellus near end of spinous dorsal and a black spot on upper part of caudal peduncle just behind base of soft dorsal.

ABUDEFDUF GLAUCUS (Cuvier and Valenciennes).

This species may be recognized at once among the other blue tide-pool fishes of Okinawa by the jet black anal opening.

ABUDEFDUF TURCHESII Jordan and Seale.

In life, bright cerulean blue with black markings on throat and breast. The smaller examples have a more or less definite black spot on body at base of last dorsal ray. The color fades rapidly as the fish dies, the body becoming dark, each scale with a dusky edge, the throat growing yellowish.

Specimens are very abundant in the pools.

ABUDEFDUF CELESTINUS (Cuvier and Valenciennes).

Large examples were seen in the market, and a few young individuals were collected from the pools. They agree in all details with Samoan specimens.

ABUDEFDUF RHOMALEUS Snyder.

Plate 65, fig. 1.

Abudehduf rhomaleus SNYDER, Proc. U. S. Nat. Mus., vol. 40, 1912, p. 534.

Family MALACANTHIDÆ.

MALACANTHUS PARVIPINNIS (Vallant and Sauvage).**OCEANOPS LATOVITTATA** (Lacépède).

Family PSEUDOCROMIDÆ.

DAMPIERIA SPILOPTERA (Bleeker).

This species is rather common in the pools.

Family CIRRHITIDÆ.

GONIISTIUS ZEBRA (Döderlein).

This species differs in color from *G. vittatus* of Hawaii; the body is not so deep and the profile above the eyes is much less gibbous.

PARACIRRHITES FORSTERI (Bloch and Schneider).

Several specimens were found in the market.

Family LABRIDÆ.¹**CHÆRODON JORDANI** (Snyder).

Plate 65, fig. 2.

Charops jordani SNYDER, Proc. U. S. Nat. Mus., vol. 35, 1909, p. 98.**LEPIDAPLOIS LOXOZONUS** Snyder.*Lepidaplois loxozonus* SNYDER, Proc. U. S. Nat. Mus., vol. 35, 1909, p. 94.**LEPIDAPLOIS MIRABILIS** Snyder.

Plate 66, fig. 1.

Lepidaplois mirabilis SNYDER, Proc. U. S. Nat. Mus., vol. 35, 1909, p. 96.**LEPIDAPLOIS PERDITIO** (Quoy and Gaimard).**EPIBULUS INSIDIATOR** (Pallas).

A fresh market specimen was bright orange, each scale having a narrow, vertical, brownish bar; dorsal with a median orange stripe, above which the membrane is suffused with green; a barely discernable brownish stripe extending through eye toward upper edge of gill opening. The same specimen, measuring 210 millimeters in length, when placed in alcohol became plain yellowish relieved by a dusky bar on the head and a few faint dark spots on the scales. A larger preserved specimen is very dark in color, the fins being almost black. The pectoral has a distinct light border and the scales have dark borders except in the region immediately above and behind the pectorals, where they are much lighter. The dark stripe on the head is very conspicuous..

HEMIGYMNUS FULIGINOSUS (Lacépède).**ANAMPSES CÆRULEOPUNCTATUS** Rüppell.**STETHOJULIS CASTURI** Günther.**STETHOJULIS PHEKADOPLURA** Bleeker.

One very small specimen from the pools is referred with some doubt to this species.

STETHOJULIS AXILLARIS Quoy and Gaimard.

Four specimens, measuring about 700 millimeters long, from the pools are identified with the Hawaiian *S. axillaris*, for when directly compared they resemble specimens from Honolulu very closely. It is probable that this species and *S. bandanensis* (Bleeker) are synonymous. In alcohol the Okinawa specimens are not abruptly lighter below as are examples of *S. bandanensis* from Samoa described by Jordan and Seale, but on the contrary the dark color of the upper

¹ *Crenilabrus stejnegeri* (Ishikawa).*Amphiprion geographicus* (Cuvier and Valenciennes).*Stethojulis paucis* (Jordan and Snyder).*Hemigymnus melapterus* (Bloch).*Halicheres trimaculatus* (Quoy and Gaimard).*Gomphosus tricolor* (Quoy and Gaimard).*Chelinus oxyrhynchus* (Bleeker).

parts is maintained almost to the ventral surface, where the transition to a lighter hue is gradual. In life the color is more like that presumed to be characteristic of *S. bandanensis*. Brown above median line with minute blue spots; scales below median line edged with bluish white, their centers bluish gray, becoming lighter on belly and blue posteriorly; chin and throat pearly white; a narrow blue stripe beneath eye, below which is a broad orange band; a bright orange spot above axil, below which is a line of black and then a cerulean blue spot; dorsal, caudal, and basal part of anal tinged with reddish orange, the edge of anal bluish.

STETHOJULIS STRIGIVENTER (Bennett).

Rather common in the pools. The young of this species measuring 70 millimeters or less in length do not have the posterior canines present.

Color in life: Body olive above, silvery below, bluish on breast and belly, rather purplish on lower part of head; a pearly blue line below eye bordered by brown; lines on sides silver and olive; dorsal pale orange, narrowly edged with pearly white, the ocellus surrounded by transparent membrane; middle of caudal suffused with orange, the outer rays tinted with blue; anal like dorsal; pectorals pink; ventrals bluish.

PLATTGLOSSUS NOTOPSIS (Kuhl and Van Hasselt).

Apparently rare in the pools. The young are brownish black; ocellus on dorsal dead black bordered by orange; a stripe along side, running from snout below eye and extending toward caudal (in many examples broken into spots posteriorly) and 2 shorter stripes below it, pearly blue; 2 lines above the median one, greenish yellow; caudal greenish yellow.

HALICHERES OPERCULARIS (Günther).

Occasionally seen in the pools. In life the body is silvery with a greenish cast, most of the scales edged with brick red or reddish brown, the dorsal ones darker where the reddish color nearly covers the scales; a small blackish spot behind eye, another on opercle, 2 or 3 near center of body and another on caudal peduncle; a pale golden stripe bordered by greenish blue below the eye, and a greenish stripe on snout before eye; dorsals with rather irregular vertical or oblique bands of red bordered by dusky, the membrane of fin tinged with golden; ocellus on soft dorsal black, the ring colorless below, orange above; median rays of caudal dotted with red, the fin narrowly edged with red; anal greenish yellow with red bands; pectorals suffused with pink; ventrals deep red at base, broadly edged with dead white.

CORIS ANNULATA (Lacépède).

Two specimens from the market measuring 270–310 millimeters in length.

CORIS VARIEGATA (Rüppell).**JULIS PULCHERRIMA** (Günther).

A market specimen measuring 250 millimeters, 68 scales. The color pattern closely resembles that of the example figured by Jordan and Evermann, Fishes of Hawaii.

CHEILIO INERMIS (Forskål).**THALASSOMA JANSONI** (Bleeker).

In examples from the market, 110 to 190 millimeters long, there are some with three distinct dark bands, others in which the bands blend somewhat on the sides, and an occasional specimen where they are entirely confluent, the upper part of body being largely black from snout to end of caudal fin; caudal peduncle light in all cases.

THALASSOMA UMBROSTIGMA (Rüppell).**THALASSOMA GUNTHERI** (Bleeker).**THALASSOMA AMELYCEPHALUS** (Bleeker).

Eight specimens collected from the pools.

THALASSOMA LUTESCENS (Sealand).

A large series of *T. lutescens*, both male and female, together with color notes made in the field show beyond doubt that *Thalassoma neanis* Jordan and Evermann¹ is a male example of *T. lutescens*. While the color of the males of this species is exactly like that described for *T. neanis*, the females are much plainer, the dark bars on the scales being more prominent. In some examples these bars become elongate, and almost uniting give the appearance of vertical lines on the sides. Some males have the superior and inferior caudal rays greatly broadened and lengthened.

THALASSOMA DORSALE (Quoy and Gaimard).

The upper part of opercle has a small round patch of scales.

CHEILINUS FASCIATUS (Bloch).

One specimen has the lateral bands very weak, there being but 2 or 3 series of elongate dusky spots on the scales.

CHEILINUS DIAGRAMMUS (Lacépède).

One example from the market is like specimens from Samoa in every detail except that there are no spots or stripes of any color on the head.

CHEILINUS TRILOBATUS Lacépède.**NOVACULICHTHYS TÆNIURUS** (Lacépède).**NOVACULICHTHYS MACROLEPIDOTUS** (Bloch).**INIUSTIUS DEA** (Temminck and Schlegel).

There are a few small scales behind the eye and at the upper edge of opercle.

¹ Jordan and Snyder, Bull. Bureau Fisheries, vol. 26, p. 214, pl. 12, fig. 2.

THALIURUS CHLORURUS (Bleek).

The upper and lower caudal lobes are considerably produced. The upper lips are frilled within, the innermost frill being conspicuously beaded or notched along the edge.

Family SCARICHTHYIDÆ.¹**CALLYODON MAORICUS (Jordan and Seale).**

Two specimens from the Naha market agree in all details with a cotype of the species. Both differ from the description, however, in having the dorsal VIII, 11, and the eye 7 in head. The posterior edge of the caudal varies from slightly convex to concave.

CALLYODON PRASIOGNATHUS (Cuvier and Valenciennes).**CALLYODON PYRRHOSTETHUS (Richardson).****CALLYODON RIVULATUS (Cuvier and Valenciennes).****CALLYODON LUNULA Snyder.**

Plate 66, fig. 2.

Callyodon lunula SNYDER, Proc. U. S. Nat. Mus., vol. 35, 1909, p. 99.

CALLYODON BOWERSI Snyder.

Plate 66, fig. 3.

Callyodon bowersi SNYDER, Proc. U. S. Nat. Mus., vol. 36, 1909, p. 602.

CALLYODON OEDEMA Snyder.

Plate 67, fig. 1.

Callyodon oedema SNYDER, Proc. U. S. Nat. Mus., vol. 36, 1909, p. 603.

CALLYODON BALINENSIS (Bleeker).**CALLYODON BICOLOR (Rüppell).**

One specimen from the market, measuring about 300 millimeters in length agrees with Bleeker's figure and description,² except that many of the spots on the sides are prolonged into vertical bands, and numerous scales have both a band and a spot. The nostril tentacle is very prominent as noted by Bleeker.

CALLYODON FORSTENI (Bleeker).

A single example of this species from the Naha market agrees perfectly with the description and figure given by Bleeker.³

Family PLATACIDÆ.**PLATAX TEIRA (Forssk.).**

Some of the teeth have the cusps of equal size while others have the median one largest, in some cases excessively long. There are no vomerine teeth.

¹ *Calotomus japonicus* (Cuvier and Valenciennes).

² Atl. Ichth., p. 33, pl. 14.

³ Idem, p. 33, pl. 2.

Family CHÆTODONTIDÆ.¹

CHÆTODON SETIFER Forakli.

Many seen in the market. One specimen caught in a tide pool.

CHÆTODON VAGABUNDUS Linnaeus.

Two small specimens were secured from a pool.

CHÆTODON ULIETENSIS Cuvier and Valenciennes.

CHÆTODON LUNULA (Lacépède).

Small specimens were occasionally seen in the pools.

CHÆTODON CITRINELLUS (Broussonet).

CHÆTODON TRIFASCIATUS Park.

CHÆTODON ORNATISSIMUS (Solander).

MEGAPROTODON TRIFASCIALIS (Quoy and Gaimard).

HÆNIOCHUS ACUMINATUS (Linnaeus).

HOLACANTHUS LEPIDOLEPIS (Bleeker).

MICROCANTHUS STRIGATUS (Cuvier and Valenciennes).

HOLACANTHUS BISHOPI Seale.

Five small specimens from the pools, measuring 24 to 43 millimeters in length agree almost perfectly with the description of this species, there being however, no white circle in front of the caudal peduncle, and in addition to other light bands on the head, there is a median line extending from tip of snout to occiput.

The curved bands are all pearly white in life, becoming purple at their narrowest places. The narrow bands are mostly purple, the broad ones mostly white. The body color is a uniform blue black.

Family ACANTHURIDÆ.²

HEPATUS OLIVACEUS (Bloch and Schneider).

HEPATUS MATOIDES (Cuvier and Valenciennes).

HEPATUS TRIOSTEGUS (Linnaeus).

Many specimens were seen in the market and four small ones were secured in the pools.

HEPATUS DUSSUMIERI (Cuvier and Valenciennes).

MONOCEROS UNICORNIS (Forakli).

MONOCEROS TUBEROSUS (Lacépède).

A single specimen agrees perfectly with the description and figure of *Naseus punctulatus* Steindachner.³

MONOCEROS BREVIROSTRIS (Cuvier and Valenciennes).

¹ *Chaetodon dardania* (Jordan and Fowler). *Holacanthus tibicen* (Cuvier and Valenciennes).

² *Hepatus elongatus* (Lacépède). *Zebrafish flavescens* (Bennett).

³ Ichth. Beitr., 1874, p. 12, fig. 8.

Family SIGANIDÆ.

SIGANUS MARMORATUS (Quoy and Gaimard).

Market and pools. One specimen exhibits a type of coloration much like that figured by Day,¹ except that the pearly lines of the fresh specimen have become brown in the preservative. In the region of the pectoral the lines are vertical.

SIGANUS LINEATUS (Cuvier and Valenciennes).

In a fresh market specimen the color was brownish above and lighter below; upper parts with many brassy spots which are bordered with olive; a large lemon yellow spot below soft dorsal; region bordering base of anal yellow; sides of head with brassy lines; dorsal dusky suffused with yellow; caudal dusky, with dark spots arranged in vertical rows; spines of anal lemon yellow, rays pearly blue, the membranes dusky, suffused with yellow; rays of ventrals yellow; pectorals uncolored. The example described measured 230 millimeters.

The preserved specimens show no trace of the bright colors of life except a mottling on the upper parts and some traces of bars on the caudal.

SIGANUS FUSCESCENS (Houttuyn).**SIGANUS ROSTRATUS** (Cuvier and Valenciennes).

One small specimen referred to this species was taken in a pool.

SIGANUS CORALLINUS (Cuvier and Valenciennes).**SIGANUS PUNCTATUS** (Bloch and Schneider).**SIGANUS VIRGATUS** (Cuvier and Valenciennes).**SIGANUS TETRAZONUS** (Bleeker).

Many specimens measuring about 600 millimeters in length were collected from the pools. In some examples there are 4 or 5 rather poorly defined bars across the back, each connecting with a spot on the dorsal, while in others the bars are very indistinct or entirely wanting.

Family BALISTIDÆ.²**BALISTES NIGER** Bonnaterre.**BALISTES VIDUA** Richardson.**BALISTES FUSCUS** Bloch and Schneider.

The single specimen obtained has 3 distinct and widely spaced rows of plates on the cheek, below which is one or more closely apposed to the scales of the throat and chin.

¹ Fishes, India, pl. 40, fig. 2.

² *Balistes capistratus* (Shaw).

Balistes flavimarginatus (Rüppell).

BALISTES CHRYSOPTERUS Bloch¹ and Schneider.

Three specimens were taken in a large pool. The largest one measured 140 millimeters.

BALISTAPUS ACULEATUS (Linnaeus).**BALISTAPUS UNDULATUS** (Park).Family **MONACANTHIDÆ**.**OSBECKIA SCRIPTA** (Osbeck).**ALUTERA MONOCEROS** (Osbeck).Family **TETRAODONTIDÆ**.¹**SPHEROIDES OCELLATUS** (Osbeck).

Two small specimens from the pools are referred with some doubt to this species.

TETRAODON HISPIDUS Linnaeus.Family **DIODONTIDÆ**.**DIODON HOLOCANTHUS** Linnaeus.Family **SCORPÆNIDÆ**.**SEBASTOPSIS GUAMENSIS** (Quoy and Gaimard).

Thirteen specimens of this species were taken in the tide pools.

SCORPÆNOPSIS GIBBOSA (Bloch and Schneider).**SYNANCEJA VERRUCOSA** Bloch and Schneider.

(*Emmedrichthys vulcanus* Jordan and Rutter.)

One example of this species was secured in the market. An examination of the type of *Emmedrichthys vulcanus* Jordan and Rutter² shows that it probably belongs to this species, certainly to this genus. The type has a malformed dorsal, the posterior part having been injured, but otherwise it agrees with specimens of this species except in color, it being plain black. The Okinawa specimen, several from Samoa, and those generally described, have a white band on the caudal. The Okinawa example has, besides that of the caudal, a white band crossing the body along a vertical through the soft dorsal and anal. The whole body is mottled with shades and tints of brown.

Family **PLATYCEPHALIDÆ**.**PLATYCEPHALUS INDICUS** (Linnaeus).**THYSANOPHRYS CROCODYLUS** (Tilostius).

¹ *Spheroides albiplumbeus* (Richardson).

Tetraodon melanocephalus (Lacépède).

Family **CHEILODACTYLIDÆ**.

Goniistius sonatus (Cuvier and Valenciennes).

² Proc. Cal. Acad. Sci., ser. 2, vol. 6, 1896, pp. 221 and 5624.

Family LATILIDÆ.

LATILUS JAPONICUS (Houttuyn).

Family OSPHROMENIDÆ.

POLYACANTHUS OPERCULARIS (Linnaeus).

Three specimens from the Imperial University, bearing the native name Tu-iwo, are said to have come from Okinawa.

Family GOBIIDÆ.¹*DORYPTENA OKINAWÆ* Snyder.

Plate 67, fig. 2.

Doryptena okinawæ SNYDER, Proc. U. S. Nat. Mus., vol. 35, 1909, p. 103.

Pools at Naha.

EVIOTA ABAX (Jordan and Snyder).

A few examples of this species do not appear to differ in any way from others taken at Tanegashima and Misaki. The first two dorsal rays are sometimes lengthened to form a filament.

EVIOTA ZONURA Jordan and Seale.

Numerous specimens of this form agree in every particular except color with examples from Samoa. The color is a little more intense in the Okinawa specimens, the pigment dots on the head tending to cluster in blotches, the scales usually being stippled near their edges, and the paired fins somewhat dusky. The lateral series of scales number 22 or 23 in individuals from both Samoa and Okinawa—not 28. Occasionally specimens have the first and second dorsal rays greatly elongate and closely united by membrane, thus forming a flat filament. The teeth of the upper jaw are in two series, an outer row of large canines and an inner band of small teeth. On the lower jaw are an outer and an inner row of canines, between which is a band of smaller teeth. It is usual to find one or two enlarged canines on each side of both jaws. The teeth of *E. ephiphanes*, the type of the genus, are similar.

HETERELEOTRIS ARENARIUS Snyder.

Plate 67, fig. 3.

Hetereleotris arenarius SNYDER, Proc. U. S. Nat. Mus., vol. 36, 1909, p. 100.

Sandy pools near Naha; apparently rare.

GNATHOLEPIS SINDONIS Snyder.

Plate 68, fig. 1.

Gnatholepis sindonis SNYDER, Proc. U. S. Nat. Mus., vol. 35, 1909, p. 101.

One specimen found in the market.

¹ *Rhinogobius nebulosus* (Forsk.)*Eleotris fusca* (Bloch and Schneider).

Five specimens, males and females, 30 to 40 millimeters long, are identified with *C. abei*. They are like the typical examples in all details of structure except that the dorsal spines are not filamentous. They differ somewhat in color, the bands of the body being less regular, the stripes of the caudal peduncle interrupted and inconspicuous, and the black spot on the spinous dorsal somewhat less distinct.

The species seems to be closely related to *Ctenogobius* (*Vaimosa*) *fontinalis*,¹ which has the opercles partly scaled, the genus *Vaimosa* being synonymous with *Mugilogobius* Smitt, of which *C. abei* is said to be the type.² It may be remarked that of 20 cotypes of *C. fontinalis* none has the spinous dorsal bordered with black as figured, but all have it light, and in many cases the black blotch near the middle is reduced to a small spot much like that seen in *C. abei*. Some specimens also have a light stripe near edge of soft dorsal.

The writer retains the genus *Ctenogobius* as used by Jordan and Snyder in *The Gobioid Fishes of Japan*. The tongue furnishes no reliable character for dividing the group, as in some cases (*C. virgatus*, *C. pflaumi*, and others) it may be concave, truncate, or even convex in different individuals of the same species. The condition of the opercle is apparently of no aid, for when a few scales are present they represent merely a more or less pronounced downward projection of the scaled area of the nape, which is itself often more or less naked (*C. similis*, *C. gymnauchen*).

CTENOGOBIUS BERNADOUI (Jordan and Starks).

This species was based on a specimen of doubtful origin,³ "probably Korea," and it is therefore of great interest that a second example, in all appearances like the type, was found in the market at Naha.

Coryphopterus can not include this species, *C. glaucofrœnum*, the type of the genus, having the head scaleless.⁴ *C. bernadoui* has a small patch of minute scales on upper part of opercle.

CTENOGOBIUS CANINUS (Cuvier and Valenciennes).

One specimen from the Naha market. There are a few large scales on the upper edge of the opercle, not more than 2 rows; the caudal is rather acutely rounded, the membrane with small, elongate black spots; ventrals jet black.

CTENOGOBIUS CAMPBELLI Jordan and Snyder.

This species has been known only from the type collected by Jordan and Snyder at Wakanoura, Japan. Six examples were secured at Naha. They do not differ from the type except in having the spots more sharply defined. The tongue is slightly notched in some specimens, truncate in others.

¹ Jordan and Seale, Bull. U. S. Bur. Fisheries, vol. 26, p. 395.

² Jordan and Starks, Proc. U. S. Nat. Mus., vol. 28, 1906, p. 206.

³ Idem, p. 207.

⁴ Gill, Proc. Acad. Nat. Sci. Phila., 1863, p. 262; also Jordan and Everman, *Fishes North and Middle America*, p. 2216.

One specimen about 40 millimeters long was secured near Naha. It is very light in color, but differs in no other way from Japanese examples.

MAPO CRASSICEPS Jordan and Seale.

This species is rather common in the pools near Naha. It is easily distinguished from similar looking gobies by the short, rounded ventral disk, the anterior part of which is markedly fleshy. The Okinawa specimens differ in no way from Samoan examples. All have scales on the upper part of the opercle.

MAPO FUSCUS (Rüppell).

Only 5 small examples were secured from the pools. Tongue immarginate; occiput scaled, sometimes to the eyes, although a narrow, naked space may usually be found just behind the eyes; snout rather pointed; chin with somewhat distinct, brown spots; sides with large brown clouds and many narrow indefinite stripes, the latter easily distinguishing the species from *G. pæcilichthys*, which it resembles in general appearance.

MAPO ÆOLOSOMUS (Ogilby).

Numerous individuals of this species collected in the pools at Naha differ in no way from specimens collected at Lord Howe Island by Mr. E. R. Waite. The species is also found in Samoa, having been recorded as *G. fuscus*, "young with dark crossbands."

The teeth are in narrow bands on the jaws; none on the vomer and palatines. The outer teeth of the upper jaw are enlarged and curved, the inner ones small except one or two on each side which are considerably enlarged. The outer row on the lower jaw are much enlarged, one or two on each side being canine-like and especially strong. The tongue is emarginate.

AMBLYGOBIUS NARAHARÆ Snyder.

Plate 68, fig. 2.

Amblygobius naraharæ SNYDER, Proc. U. S. Nat. Mus., vol. 35, 1909, p. 101.

Tide pools at Naha.

PERIOPHTHALMUS CANTONENSIS (Osbeck).

Abundant on the flat tidelands where thousands may be seen in long skirmish lines advancing ahead of the incoming tide or following the receding water.

ZONOGOBIUS SEMIDOLIATUS (Cuvier and Valenciennes).

Numerous specimens 38 millimeters long were found in the rock pools. The species also occurs at Tanegashima.

XENISTHMUS PRORIGER Snyder.

Plate 68, fig. 3.

Xenisthmus proriger SNYDER, Proc. U. S. Nat. Mus., vol. 35, 1909, p. 105.

Pools at Naha.

PARAPERISC HEXOPHTHALMA (Ehrenberg).

Six specimens of this species were secured in the market at Naha. A description of one measuring 180 millimeters follows.

Head 3.5 in the length; depth 6.2; depth caudal peduncle 3 in head; eye 4.5; snout 2.5; interorbital space 8.6; D. V., 21; A. 17; scales lateral series 64; between lateral line and origin of dorsal 18.

The snout is pointed, the mouth large, maxillary reaching a vertical through anterior edge of pupil. Teeth simple, occurring in narrow bands on jaws and vomer, the palatines being naked; outer side of upper jaw with a row of enlarged, simple teeth that curve backward; front of lower jaw with similar teeth which are followed by a short space in which small teeth only are present; these in turn followed by 3 large curved canines and then a single row of smaller teeth. There are 13 very short gill-rakers, 9 of which are on the lower limb of the arch. Of the dorsal spines, the third and fourth are highest. The highest rays of the dorsal are located near the middle of the fin; their length contained 2 times in the head. The anal is inserted directly beneath the fourth dorsal ray. The posterior rays of dorsal and anal do not reach the base of caudal. The caudal is somewhat rounded or truncate posteriorly except for one or two of the upper rays which project in a sharp point. Pectoral rounded, reaching a vertical through anal opening. Ventral rays broadened and much thickened near tips; the next to inner ray longest.

The number of dorsal spines does not vary from 5 in the 6 specimens. There are from 19 to 21 dorsal rays and 17 or 18 anal rays.

Color in life, brownish gray above, grayish white beneath; upper two-thirds of body with many small spots with brown centers and lighter margins; head greenish gray, bluish white beneath; snout with ocelli, the centers of which are light brown, the margins orange; sides of head with orange spots; sides of body above middle of anal with three conspicuous ocelli with brownish black centers and lemon yellow rings. Dorsal lemon yellow, narrowly edged with white; with three rows of dark brown spots surrounded with transparent rings. Anal similar to dorsal except that the spots are surrounded by a pearly white area. Caudal with a large median, brownish black area, above and back of which are many smaller spots; black area with a posterior margin of dead white.

In spirits the brownish black figures only persist.

Young examples have 6 or 7 ocelli in line with the 3 large ones above anal fin, the anterior ones disappearing with age.

PARAPERISC TETRACANTHA (Lacépède).

There are no teeth on the palatines. The posterior middle of caudal has a large, square, dead white spot.

PLATOPHYRYS MYRIASTER (Temminck and Schlegel).

One small specimen from a pool.

Family SOLEIDÆ.

ZEBRIAS JAPONICUS (Bleeker).

One specimen measuring 42 millimeters, from a pool.

PARDACHIRUS PAVONINUS (Lacépède).

Two small specimens from a pool. Neither has scales on the fin rays, but otherwise both agree perfectly with descriptions of the species.

TRULLA ITINA Snyder.

Plate 69, fig. 1.

Trulla itina SNYDER, Proc. U. S. Nat. Mus., vol. 36, 1909, p. 609.

Family CALLIONYMIIDÆ.

SYNCHIROPUS OCELLATUS (Pallas).

One specimen from the pools.

Family GOBIESOCIDÆ.

ASPASMA MINIMA (Doderlein).

Plate 69, fig. 2.

A single specimen of a species that is identified with some doubt as *Aspasma minima* was taken in a pool near Naha. Many specimens of the same form were taken near Misaki, Japan. They agree closely with Doderlein's description, except in the number of rays in the anal fin, which are there given as 5. Among 14 examples it was found that 2 had 6, 8 had 7, while 4 had 8 rays. The dorsal has 7 rays. The nostrils are tubular. The teeth are blunt, in 2 series on the upper jaw, the inner row having 4 teeth on each side. The teeth of the lower jaw are in a single series, flattened laterally, the edges concave. Pseudobranchiæ are present; gills developed on 3 arches. The ventrals are united laterally with the pectorals. A small anal papilla is present.

In life the color is brownish olive, changing on immersion in spirits to bright reddish, then slowly fading through flesh color to pale yellowish white.

The species inhabits the outlying tide pools. Nothing could be learned of its habits, and individuals were seen only after the water had been thoroughly poisoned with formalin, chloride of lime, or other irritating matter.

ASPASMA MISAKIA Tanaka.

Plate 69, fig. 3.

Twelve specimens of this species were taken in the pools at Naha, where it appears to be more commonly represented than at Misaki. Examples were taken at Tanegashima. At Misaki it appeared to be associated with the above species. A figure drawn before the species was described by Mr. Tanaka is here reproduced.

The dorsal contour of the snout is straight or concave, more often concave, but not convex as originally figured.

In life the body is grayish white with a yellowish tint, the yellow more pronounced on the ventral parts of the sides; upper parts reddish brown, the lighter body color showing in a larger or smaller degree near the center of each scale; bands of body brownish, the scales which border the bands edged with reddish; snout, chin, sides of head and throat suffused with brick red; fins with narrow bands of brick red, the color being located only on the rays and spines; lower rays of pectoral suffused with yellow.

The species appears to be rare at Naha, 3 specimens only having been secured.

ENNEAPTERYGUS TUSITALÆ Jordan and Seale.

Enneapterygius pardochir JORDAN AND SEALE, Bull. U. S. Bur. Fish., vol. 25, 1906, p. 417 (females).

A dissection of 10 specimens each of the dusky *E. tusitalæ* and the lighter colored *E. pardochir* leads to the conclusion that both are representatives of the same species, *E. pardochir* being described from a female. The figure of *E. tusitalæ* shows the spinous and rayed dorsals united at their bases, a condition not to be found in the cotypes.

ALTICUS ELLIPES (Jordan and Starks).

A small nasal tentacle is present.

In life the sides of the head and body have many dark-edged pearly ocelli, those of the body being elongate while those of the head are nearly round, the latter varying in number and intensity of color.

ALTICUS NOVEMMACULOSUS Snyder.

Plate 69, fig. 4.

Alticus novemmaculosus SNYDER, Proc. U. S. Nat. Mus., vol. 35, p. 107.

Abundant in the pools at Naha.

SALARIAS FASCIATUS (Bleek).

This species was recorded by Jordan and Snyder¹ as *S. ceramensis* Bleeker.

SALARIAS LINEATUS Bleeker.

SALARIAS ANDERSONI Jordan and Starks.

In life the spots on the sides are brownish gray above, becoming pale, pearly blue on lower parts; spots on side of head with a greenish tint; large spot anterior to base of dorsal light golden brown, bordered by pearly gray, outside of which is a broader border of olive brown; body brownish olive; membranes of dorsal and caudal transparent olive, narrowly edged with pale reddish; spines and rays alternately

¹ Proc. U. S. Nat. Mus., vol. 25, 1903, p. 458.

banded with brownish olive and greenish gray; anal rays tipped with yellowish olive.

SALARIAS MUSCARUS Snyder.

Plate 70, fig. 1.

Salarias muscarus SNYDER, Proc. U. S. Nat. Mus., vol. 35, 1909, p. 109.

One specimen from a pool at Naha.

SALARIAS SINUOSUS Snyder.

Plate 70, fig. 2.

Salarias sinuosus SNYDER, Proc. U. S. Nat. Mus., vol. 35, 1909, p. 109.

Pools at Naha.

SALARIAS QUADRICORNIS Cuvier and Valenciennes.

Scartichthys enosimæ JORDAN and SNYDER, Proc. U. S. Nat. Mus., vol. 25, 1903, p. 460.

Salarias rivulatus JORDAN and SEALE, Bull. U. S. Bur. Fish., vol. 25, p. 429.

Salarias enosimæ appears to differ in no way from *S. quadricornis*. *S. quadricornis* differs from *S. rivulatus* in having tentacles on the nape. The latter is apparently related to *S. zebra* of Hawaii. Specimens recorded as *S. rivulatus* from Samoa prove on close examination to be representatives of *S. quadricornis*.

PETROSCIRTES LOXOZONUS Jordan and Starks.

The canines of the upper jaw are separated from the other teeth by a conspicuous open space. Curved canines, much longer than those above, are present in the lower jaw, no space existing between them and the other teeth. On each side of lower jaw, at angle of mouth is a peculiar flap, above which the lip forms a small fold partly inclosing the upper canine.

Color in life: Body with narrow, pearly white bands and reticulations which along the back inclose deep green areas that are margined with olive; on sides, the green areas extend downward and become brownish; other parts light olive, growing yellowish toward the caudal and whitish on the abdomen; chin yellowish, with small olive spots; spinous dorsal yellowish olive, with light yellow stripes; soft dorsal yellow, with oblique pearly white stripes; caudal yellow edged with red, the filamentous tips bright red; anal yellow, with oblique lines and a narrow margin of pearly white; ventrals bright yellow.

ENCHELYURUS HEPBURNI Snyder.

Plate 70, fig. 3.

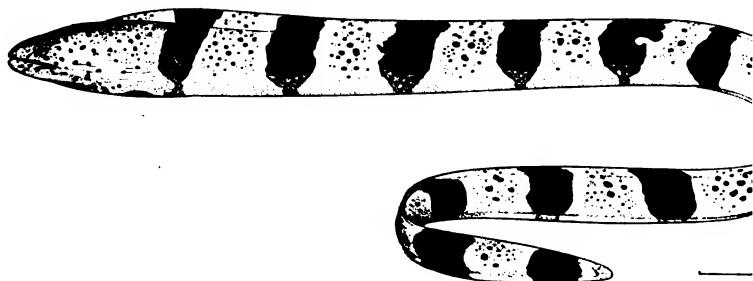
Enchelyurus hepburni SNYDER, Proc. U. S. Nat. Mus., vol. 35, 1909, p. 110.

Pools at Naha.

CRISTICEPS FLAMMEUS Jordan and Starks.

This species is abundantly represented at Okinawa, while it is comparatively rare at Tanegashima where it was first discovered. Large, flat tentacles are present at the nostrils.





1. GYMNOTHORAX CHLAMYDATUS. (PAGE 493.) FROM THE TYPE.



2. MICROPHIS EXTENSUS. (PAGE 495.) FROM THE TYPE.



3. ICHTHYOCAMPUS NOX. (PAGE 495.) FROM THE TYPE.



1. MICROPHIS OCELLATUS. (PAGE 495.) FROM THE TYPE.

2. APOGONICHTHYS NAFÆ. (PAGE 497.) FROM THE TYPE.

3. PLATYNIUS AMÆNUS. (PAGE 499.) FROM THE TYPE.

1. PENTAPUS FORMOSULUS. (PAGE 500.) FROM THE TYPE.

2. ABUDEFDUF RICHARDSONI. (PAGE 504.) FROM THE TYPE.

3. ABUDEFDUF REX. (PAGE 504.) FROM THE TYPE.

ABUDEFDUF RHOMALEUS. (PAGE 505.) FROM THE TYPE.

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2. CHÆRODON JORDANI. (PAGE 506.) FROM THE TYPE.

1. LEPIDAPLOIS MIRABILIS. (PAGE 506.) FROM THE TYPE.

2. CALLYODON LUNULA. (PAGE 509.) FROM THE TYPE.

3. CALLYODON BOWERSI. (PAGE 509.) FROM THE TYPE.

1. CALLYODON ŒDEMA. (PAGE 509.) FROM THE TYPE.

2. DORYPTENA OKINAWÆ. (PAGE 513.) FROM THE TYPE.

3. HETERELEOTRIS ARENARIUS. (PAGE 513.) FROM THE TYPE.

1. GNATHOLEPIS SINDONIS. (PAGE 513.) FROM THE TYPE.

2. AMBLYGOBIUS NARAHARÆ. (PAGE 515.) FROM THE TYPE.

3. XENISTHMUS PRORIGER. (PAGE 515.) FROM THE TYPE.

1. TRULLA ITINA. (PAGE 517.) FROM THE TYPE.

2. ASPASMA MINIMA. (PAGE 517.)

3. ASPASMA MISAKIA. (PAGE 517.)

4. ALTICUS NOVENMACULOSUS. (PAGE 518.) FROM THE TYPE.

1. SALARIAS MUSCARUS. (PAGE 519.) FROM THE TYPE.

2. SALARIAS SINUOSUS. (PAGE 519.) FROM THE TYPE.

3. ENCHELYURUS HEPBURNI. (PAGE 519.) FROM THE TYPE.

DESCRIPTIONS OF TWO NEW PARASITIC ISOPODS BELONGING TO THE GENERA PALÆGYGE AND PROBOPYRUS FROM PANAMA.

By HARRIET RICHARDSON,

Collaborator, Division of Marine Invertebrates, United States National Museum.

A number of specimens representing a new species of *Palægyge* and four specimens representing a new species of *Probopyrus* were collected in 1911 by Dr. S. E. Meek and Mr. S. F. Hildebrand at Panama and the Canal Zone, during a biological survey of the Isthmus of Panama under the auspices of the Smithsonian Institution. The specimens were found parasitic on *Macrobrachium acanthurus* and *M. jamaicense* as well as on the young of the latter or *M. olfersii*.

PALÆGYGE MEEKI, new species. ♀

Body of female ovate, somewhat asymmetrical. Length, 9 mm.; width, 7 mm. Color of dorsal surface white, with a few lines of black along the median line and on either side about halfway between the median line and the lateral margins. Incubatory lamellæ on one side covered with black lines; on the other side only the first one is covered, the others having a few black lines at the base.

Head large, 2 mm. long and $2\frac{1}{2}$ mm. wide, deeply set in the thorax; anterior margin widely rounded with the antero-lateral angles produced in small acute lobes. Eyes absent. (See fig. 1.) First two segments of thorax short in the median dorsal line and about equal in length; the following five segments are much longer in the median line and are subequal. Epimera are present on the first four segments, occupying the anterior two-thirds of the lateral margin. Ovarian bosses are also present on these segments and are placed on the anterior part of the sublateral margin. On the last three segments the epimera occupy the entire lateral margin.

All six segments of the abdomen are distinct. The sixth or terminal segment has a posterior incision which extends half the length of the segment, forming two posterior lobes. There are five pairs of double-branched pleopoda, a pair for each of the first five segments, making

1. The first part of the document is a title page. It contains the title "THE HISTORY OF THE UNITED STATES OF AMERICA" and the author's name "BY JAMES M. SMITH".

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3. The third part of the document is the main body of the text. It is divided into several chapters, each covering a different period of American history.

4. The fourth part of the document is a conclusion. It summarizes the main points of the book and offers some final thoughts on the history of the United States.

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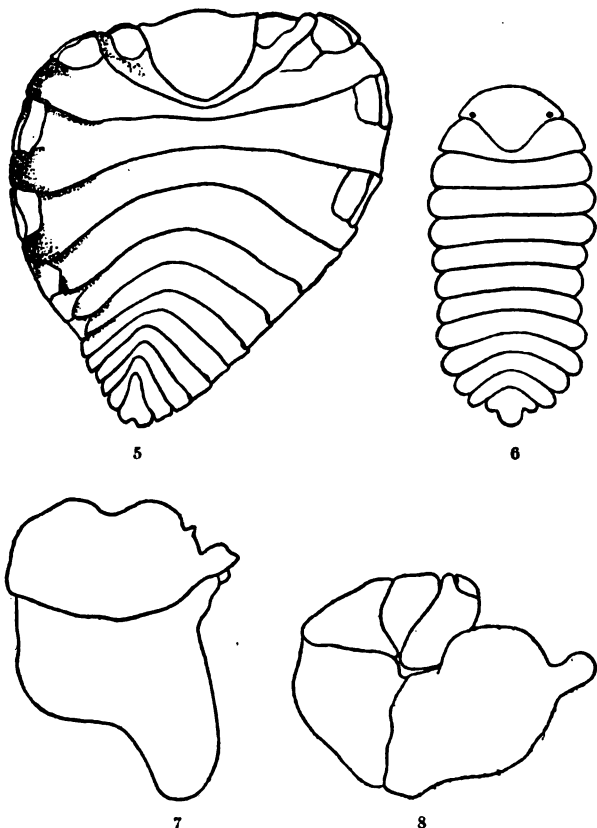
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9. The ninth part of the document is a list of illustrations. It includes a list of pictures and maps that are included in the book.

10. The tenth part of the document is a list of acknowledgments. It includes a list of people and organizations that the author thanks for their help in writing the book.

Body of female ovate, somewhat asymmetrical, 10 mm. wide, mm. long. Color white with a few markings of reddish-brown one side of the thorax.

Head a little wider than long, 4 mm.:3 mm. Anterior margin widely rounded; antero-lateral angles small, acute. Head deeply immersed in the thorax. Eyes absent. (See fig. 5.)



FIGS. 5-8.—PROBOPTERUS PANAMENSIS. 5, FEMALE, $\times 4\frac{1}{2}$; 6, MALE, $\times 23$; 7, FIRST INCUBATORY PLATE OF FEMALE, $\times 14\frac{1}{2}$; 8, SIXTH LEG OF FEMALE, $\times 23$.

First segment of thorax very short in the middle of the dorsal region; second segment twice as long as the first in the middle of the dorsal region; third segment as long as the first and second segments taken together; last four segments subequal. Ovarian bosses are present on the first four thoracic segments; they occupy two-thirds of the sublateral margin of the first segment, one-half that of the second and third segments, and a little more than half that of the fourth segment. Lateral to the ovarian bosses are the epimeral

segments the spinous occupy the entire lateral margin.

All six segments of the abdomen are distinct. The sixth terminal segment has a small rounded notch in the middle of the anterior extremity. There are five pairs of double-branched pleopods, a pair for each of the first five segments. The uropoda are absent. There are five pairs of incubatory plates; the first pair has a small rounded lobe at the distal extremity of the distal segment produced in a short rounded lobe. (See fig. 7.) All the incubatory lamellæ are reddish-brown, those on one side being more complex than those on the other side. The legs are all provided with a high carina on the basis. (See fig. 8.)

The male is rather short and thickset, being twice as long as the female. The head is small, with the anterior margin widely rounded. The posterior margin is produced backward in a peculiar way, being crenate in the first thoracic segment. (See fig. 6.) Eyes are present in the post-lateral angles. All the segments of the thorax are distinct. The first four segments of the abdomen are distinct on the sides, but more or less confluent in the middle of the dorsum. The last two segments are fused in a single terminal piece, with crenations at the sides indicating the two segments. There are five pairs of rudimentary pleopoda, but no uropoda.

Two specimens of this species were collected by Doctor J. H. Hildebrand in a small creek at Pariso, Canal Zone. The parasite is parasitic on *Macrobranchium acanthurus* (Wiegmann), being found in the branchial cavity.

The type is Cat. No. 43503, U.S.N.M.

This species differs from all the described species of the genus from the Atlantic Coast of North America in the presence of a distinct terminal abdominal segment of the female. *Probopoda idensis*, however, has a minute excavation. The first incubatory plate of the female is different in the two species, as well as the markings; the head, abdomen, and proportions of the male are different. The shape of the head and of the abdomen of the female is different from any of the described species.

DESCRIPTIONS OF TWO NEW SPECIES OF FISHES, FROM HONOLULU, HAWAII.

By DAVID STARR JORDAN and CHARLES WILLIAM METZ,

Of Stanford University, California.

In a recent visit to Honolulu, two new species of fishes were obtained and placed in the United States National Museum. These species are described in this paper.

HOLACANTHUS POTTERI Jordan and Metz, new species.

Plate 71, fig. 1.

Dorsal XIV, 19; anal III, 18 or 19; scales about 45; transverse series between anal and dorsal 20. Measurements in hundredths of length: Head 32; depth 58; eye 11; snout 11; postorbital part of head 11; interorbital 10; depth of caudal peduncle 14; snout to dorsal 40; snout to anal 63.

Body short, ovate, deep, greatly compressed, deepest through base of ventrals; dorsal outline more convex than ventral; snout bluntly conic, or rounded; profile from snout to dorsal gently, evenly curved; dorsal fin rather high, last spine equal to depth of caudal peduncle; first spine short, inserted above posterior margin of opercle; spines 1 to 5 graduated, remainder about equal, slightly shorter than first ray; soft dorsal evenly rounded, middle rays longest; caudal rounded; anal similar to soft dorsal, but tapering more rapidly in front; anal spines graduated, third the longest; ventrals inserted slightly behind pectorals, outer ray of each somewhat filamentous, reaching to third anal spine; pectoral reaching to above second anal spine. Eye rather large, high, almost entering profile; interorbital slightly convex; nostrils near eye, anterior with small flaps on posterior border; lower margin of preopercle with three spines, the upper one large, equal to diameter of eye, and reaching nearly to base of pectoral; margin of preopercle above with a series of 8 to 10 small, spine-like serræ; opercle unarmed; suborbital with three or four very small spines on posterior margin; gill-rakers numerous, slender; teeth fine, setiform, in single series.

snout, cheeks, and orbitals entirely covered with small scales; all scales roughly ctenoid.

Color in spirits: Ground color white, broken by many narrow, dark bands, or reticulations. On the body behind the head are about 21 of these running transversely; those on the posterior half extend entirely across, while those back of the pectoral turn abruptly in a horizontal direction; head covered with numerous similar stripes, confluent above, and joining others on the breast below; four or five of these cross the interorbital area, while between the dorsal fin and the snout are 13 or 14, one of which forms a complete ring around the mouth on the lips. Spinous dorsal pale, broken by extensions of the body stripes; soft dorsal darker, with reticulations and three or four horizontal wavy dark bars, tip edged with black; caudal dark; anal similar to soft dorsal, but markings largely obliterated by general dark color; pectorals and ventrals white, except for ventral filaments. On each side, behind and above the pectoral base, is a large, black blotch, of irregular outline, conspicuous in fresh specimens, but possibly fading with age.

Color in life: The light spaces on the body were pale pink or flesh color, the darker cross-streaks were of carnelian or dull red-orange. The soft parts of the vertical fins were blackish, the edges bright lustrous blue.

This species is quite distinct from other Hawaiian species in color and form, as well as many less conspicuous characters.

This little fish was seen alive by Doctor Jordan in the Waikiki aquarium at Honolulu. It was recognized as a new species and one of exquisite delicacy of coloration.

Type.—The type was presented to the United States National Museum by Mr. Frederic A. Potter, director of the aquarium, for whom the species is named. The specimen was taken from the coral reef at Honolulu. It is numbered 73911 in the United States National Museum. It is 2.9 inches in length.

CHROMIS VERATER Jordan and Metz, new species.

Plate 71, fig. 2.

Head 3.75 in length to base of caudal, depth 1.80. Dorsal rays XIV, 13; anal 11, 14; scales 4-27; pores 18; eye 3 in head; snout 4.25; maxillary 3; interorbital space 2.80.

Body short, very deep, ovate, much compressed; dorsal outline evenly curved, except for a slight interorbital depression; ventral outline slightly less curved; head as deep as long, snout short, blunt;

conic, inner series small, somewhat irregular; interorbital area rather broad, convex with a transverse depression, snout, suborbital, lower jaw and opercles scaled; opercle and preopercle entire; caudal peduncle stout, deep, compressed, nearly twice as deep as long; caudal shallow-emarginate, upper lobe a trifle the longer; spinous dorsal nearly uniform in height from third to last spine, 1.8 in head, about two-thirds height of soft dorsal which is somewhat pointed, with fourth to eighth rays longest; anal similar to soft dorsal but longer, first spine small, second very large, three times first; base of pectorals below origin of dorsal; base of ventrals below posterior base of pectoral; ventrals rather long, reaching anal; scales large, ctenoid, regular; lateral line following outline of back, ending below origin of soft dorsal, beginning again on caudal peduncle, base of fins scaled; spinous dorsal depressible into groove of scales and with row of scales on membrane between each two spines; body scales somewhat angular at apex, not evenly curved.

Color in alcohol: Very dark chocolate brown, slightly lighter below, and darker on head; all fins except the pectoral uniform blackish; pectoral translucent, axil black, a large obscure round pale light spot at base of last rays of dorsal and of anal; scales of body margined, this giving a latticework impression.

Type.—Of this species we have two specimens obtained by the senior writer at Honolulu, the type 7 in. long, in the United States National Museum (No. 73912), and a cotype a little smaller, sent to the Carnegie Museum in Pittsburgh, the two found at the same time in the market of Honolulu, in company with *Chromis ovalis*.

This is the deepest in body of all the species of *Chromis*. Its nearest relative seems to be *Chromis axillaris* Bennett from Mauritius.

It is well separated from the other two Hawaiian species. *Chromis ovalis* Steindachner has a deeply forked caudal, and is more elongate. *Chromis elaphrus* Jenkins is more elongate, and differs in various details of form and color.

In this connection, we may note that *Myripristis berndti* Jordan and Evermann from Honolulu is not distinct from *Myripristis murdjan*. Most of the specimens referred by Jordan and Evermann to *Mulloidides samoensis* seem to belong rather to *Mulloidides preorbitalis* (Smith and Swain) (not a *Pseudupeneus*). *Mulloidides samoensis* occurs at Honolulu and was obtained at this time. The snout in *M. preorbitalis* is longer and less decurved. The figure of "*Dascyllus albisella*," reproduced by Jordan and Evermann from Bleeker, belongs to *Dascyllus trimaculatus* of the East Indies.

1. *HOLACANTHUS POTTERI*. (PAGE 525.) FROM THE TYPE.

2. *CHROMIS VERATER*. (PAGE 526.) FROM THE TYPE.

A REVISION OF THE SUBSPECIES OF THE GREEN HERON (*BUTORIDES VIRESCENS* [LINNÆUS]).

By HARRY C. OBERHOLSER,

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The following revision of the forms of *Butorides virescens* (Linnaeus) was undertaken at the instance of Mr. H. W. Henshaw, Chief of the Biological Survey. Its purpose is to clear away, as far as the present material will permit, the confusion now existing with regard to the relationships and distribution of the various races, and thus to assist in preparing the way for a bulletin on the migration and distribution of North American herons, now in course of preparation by Prof. W. W. Cooke, and soon to appear as a publication of the Biological Survey.

For this task the writer has been able to examine 568 specimens, including the types of all the forms of this species, excepting *Butorides virescens virescens*, *Butorides virescens frazari*, and *Butorides virescens maculatus*; and comprising the entire series of green herons in the collections of the United States National Museum, including that of the Biological Survey; the American Museum of Natural History; the Academy of Natural Sciences of Philadelphia, including that of Mr. H. W. Fowler; the Museum of Comparative Zoology in Cambridge, Massachusetts, including the Bangs collection; and the collection of Dr. Jonathan Dwight, jr.; together with a few important birds from the Carnegie Museum of Pittsburgh, Pennsylvania, and the Field Museum of Chicago. To the authorities of these institutions, particularly the United States National Museum, and to the individuals mentioned, as well as to the custodians of the various bird collections, especially Dr. Charles W. Richmond, of the United States National Museum, the writer takes this occasion to offer expression of his sincere appreciation of facilities afforded.

The various races of *Butorides virescens* with their intricate relationships and rather peculiar geographical distribution, have always presented a difficult problem. Previous authors who have wrestled with these difficulties have lacked sufficient material, particularly

States, Mexico, Central America, and the West Indies to northern South America. In the northern part of the Neotropical Region it inhabits the Lower Tropical and Upper Tropical zones; in the southern portion of the Nearctic Region, the Lower Austral, Upper Austral, and Transition zones. The total number of its recognizable races becomes now 18, of which 12 are insular, most of them West Indian. The favorite haunts of the species are the swamps, marshes, large and small streams, both along the seacoast and in the interior; but not infrequently the bird chooses dry upland for its nesting sites, though usually not far from water, from which it obtains the greater part of its food. It is a frequenter of the reedy or bushy marshes, sparsely wooded swamps, the margins of bayou, lake, and stream, of damp thickets, and the more or less open country, rather than of the deep forest. With the exception of the northernmost three, *Butorides virescens virescens*, *Butorides virescens anthonyi*, and *Butorides virescens eremonomus*¹, all the forms appear to be permanently resident; but these three perform extensive migrations.

Some curiously close resemblances between widely separated races may be mentioned, as of interest from an evolutionary point of view. The bird from Swan Island, in the Caribbean Sea—*Butorides virescens saturatus*—is colored much more nearly like *Butorides virescens frazari*, from Lower California, than like *Butorides virescens virescens* of the adjacent mainland. Also, *Butorides virescens mesatus*,² from Nicaragua, is, in size and color, more like the race from northern Mexico, *Butorides virescens eremonomus*,¹ than like the intervening *Butorides virescens virescens* or the Costa Rican *Butorides virescens hypernotius*.³ The bird inhabiting the Pearl Islands, in the Bay of Panama, is, likewise, in appearance nearer *Butorides virescens saturatus*, from Swan Island, than to *Butorides virescens hypernotius*³ on the neighboring mainland. The Bahaman *Butorides virescens bahamensis* is very different from both *Butorides virescens virescens*, from Florida, and *Butorides virescens cubanus*,⁴ from Cuba, and, in color, much more like *Butorides virescens anthonyi* of Arizona. The subspecies living on the island of St. Christopher, *Butorides virescens christophorensis*,⁵ is much more like *Butorides virescens bahamensis* than it is like *Butorides virescens cubanus*,⁴ which almost surrounds it; and *Butorides virescens barbadensis*,⁶ from Barbados, is much closer in color to the geographically far distant *Butorides virescens bahamensis* than to any of the several intervening races. Again, the birds from the islands of Martinique (*Butorides virescens maculatus*), St. Lucia (*Butorides virescens lucianus*),⁷ and Grenada (*Butorides virescens grenadensis*)⁸ are nearer in appearance to *Butorides virescens cubanus*⁴

¹ See p. 546.² See p. 549.³ See p. 561.⁷ See p. 565.³ See p. 548.⁴ See p. 557.⁶ See p. 567.⁸ See p. 568.

in some examples is dull oily green, in others decidedly bluish with a glaucous bloom; also in the depth and shade of the chestnut, maroon, or fulvous of the neck and sides of the head.

The characters which separate the various subspecies are largely differences of size, and of the colors of the hind neck, sides of the head, and of the entire lower surface. The color differences of pileum, back, wings, and tail are of very little value in diagnoses, since these are due chiefly to age, season, or individual variation. The names of colors used in my descriptions are based on Mr. Robert Ridgway's Nomenclature of Colors.¹

All the measurements in this paper are in millimeters. The specimens used in the average measurements under each subspecies, and which form the basis of comparison, are, just as far as possible, from typical specimens; that is, from examples representing the best differentiation. In the tables of detailed measurements all the specimens used in the diagnostic averages are indicated by a minuscule; and all other than adult birds are noted. The various dimensions of which use is made in the following pages have been taken as follows:

Length of wing.—Measured in a straight line from the bend of the closed wing to the end of the longest primary with these feathers in their natural position; that is, not straightened.

Length of tail.—Taken with dividers from the point of insertion of the middle rectrices to the tip of the longest.

Exposed culmen.—Measured in a straight line from the beginning of the feathers on the culmen to the tip of the maxilla; that is, the chord of the exposed culmen.

Height of bill.—The distance in a straight line from the base of the exposed culmen to the nearest point on the ramus of the mandible.

Length of tarsus.—A straight line from the center of the heel joint on the posterior side to the middle of the joint between the metatarsus and the middle toe on the anterior side.

Middle toe.—Measured along the upper side from the middle of the joint between the metatarsus and the middle toe to the base of the uncovered claw.

BUTORIDES VIRESCENS VIRESCENS (Linnaeus).

[*Ardea*] *virescens* LINNÆUS, Syst. Nat., ed. 10, vol. 1, 1758, p. 144 (America) (based on "Ardea stellaris minima," CATESBY, Nat. Hist. Carolina, Florida, and Bahama Islands, vol. 1, 1731, p. 80, pl. 80 [Virginia and Carolina]).

Ardea chloroptura BODDAERT, Tabl. Planch. Enlum., 1783, p. 54 (based on "Crabier de la Louisiane," DAUBENTON, Planch. Enlum., No. 909; and "Crabier roux à tête et queue vertes," BUFFON, Hist. Nat. des Oiseaux [ed. Deux Ponts], vol. 14, p. 146; orig. ed., vol. 7, 1780, p. 407 [Louisiana]).

[*Ardea*] *ludoviciana* GMELIN, Syst. Nat., vol. 1, pt. 2, 1789, p. 630 (based on "Crabier roux à tête et queue vertes," BUFFON, Hist. Nat. des Oiseaux, vol. 7, 1780, p. 407; "Crabier de la Louisiane," DAUBENTON, Planch. Enlum., No. 909; "Louisiane Heron," PENNANT, Arctic Zool., vol. 2, 1785, p. 448, No. 350; and "Louisiane Heron," LATHAM, Gen. Synopsis Birds, vol. 3, pt. 1, 1785, p. 81, No. 47) (Louisiana).

¹ Ridgway, Nomenclature of Colors for Naturalists, Boston, 1886.

Description.—Adult male, No. 222010, U.S.N.M.; l'On Swamp, Christchurch Parish, South Carolina, April 26, 1911; Dr. E. A. Mearns; original number, 19115. Pileum, occipital crest, postocular region, and a short subauricular streak, deep, glossy bottle green; malar stripe cream buff; submalar stripe purplish maroon mixed with blackish; cheeks, auriculars, sides and back of neck, purplish maroon, somewhat more rufescent anteriorly, paler and somewhat glaucous posteriorly; upper surface of body deep bottle green, somewhat glossy, the long, pointed, plume-like feathers of back and scapulars glaucous and somewhat bluish; wings fuscous, the primaries and outer secondaries dull dark greenish-blue slate color, the innermost primaries and outermost secondaries narrowly tipped with white; tertials, outer webs of inner secondaries, with greater, median, and lesser wing-coverts, dark, glossy bottle green, the tertials pointed but not plume-like; the outer scapulars on exterior webs and the first rows of lesser wing-coverts margined all around rather narrowly with tawny ochraceous, the other rows and median coverts with buff, the greater coverts and outer webs of tertials and innermost secondaries with white; tail dull, dark, grayish blue-green; chin and middle of upper throat creamy white, streaked medially with dark blackish brown, sparingly on the former, heavily on the latter; jugulum purplish maroon, conspicuously streaked medially with creamy white and dark brown; breast, abdomen, sides, crissum, and axillars, slate gray, with a slight brownish tinge, the longest feathers of under tail-coverts with darker centers and paler margins; thighs rufescent; lining of wing slate gray, the feathers margined with buff, the edge of wing broadly buffy white.

“Bill deep black, the lower mandible sometimes partly yellowish or greenish; lores and orbits varying from olive-green to bright yellow; iris gamboge yellow; legs and feet olive green or olive yellow, the scutellæ more greenish; claws horn-color” (Ridgway).

Measurements.—Total length (in flesh), 394–490 mm.; extent of wing, 521–711; weight, 6.25–7.50 ounces.

Male:¹ Wing, 176–188 (average, 181.1) mm.; tail, 61.5–71 (66.5); exposed culmen, 58–69 (60.9); height of bill at base, 11–13 (12.1); tarsus, 51–57 (53); middle toe, 44.3–48.5 (45.0).

Female:² Wing, 170–183.5 (175.1) mm.; tail, 58.5–74.5 (65.5); exposed culmen, 56–62.5 (59.8); height of bill at base, 9.0–12.8 (11.7); tarsus, 48–55 (51.2); middle toe, 44–49 (45.7).

Type-locality.—Coast of South Carolina.³

¹ Fourteen specimens, from Pennsylvania, New Jersey, Maryland, Virginia, the District of Columbia, and Kansas.

² Thirteen specimens, from New York, New Jersey, Pennsylvania, Maryland, Virginia, Indiana, Missouri,

Nova Scotia; St. John, southern New Brunswick; Calais and Pittsfield, southern Maine; Montreal, southern Quebec; Ottawa, Guelph, and Neebish Island, southern Ontario; Grand Rapids, southern Michigan; Sturgeon Bay and Kelley Brook, northern Wisconsin; Minneapolis, central Minnesota; and Fort Sisseton, northeastern South Dakota; west to Fort Sisseton, eastern South Dakota; Neligh and Gibbon, eastern Nebraska; western Kansas; Fort Reno and Chattanooga, central Oklahoma; Pecos City and Fort Stockton, western Texas; casually to Loveland, central Colorado, and Rinconada, northern New Mexico;¹ Tampico, eastern Tamaulipas; Isla de los Frijoles, and Rivera, eastern Vera Cruz; San Mateo, near City of Mexico, Mexico; and western Mexico (from Patzcuaro, western Michoacan, and Ocotlan, eastern Jalisco) to the Pacific coast north as far as Mazatlan, southern Sinaloa; south to the Dry Tortugas, Florida; the Gulf coast of the United States, from Florida to Brownsville, Texas; the Pacific coast of southern Mexico, at Manzanillo (Colima), Papayo, (Guerrero), and Tonalá, (Chiapas); Chiapam (=Champerico) and Dueñas, southern Guatemala; Omoa and Ceiba, northern Honduras; east to Ceiba, Honduras, and the eastern coasts of British Honduras, Yucatan, Mexico, the United States, and Nova Scotia. Winters chiefly in Honduras, Guatemala, central and southern Mexico, Florida, and the Bermuda Islands. Accidental at Fajardo, Porto Rico.

Throughout the wide range of this form there is surprisingly little geographical variation, and no further subspecific subdivision seems advisable, at least with present material. Birds from the northeastern United States represent the extreme differentiation of *Butorides virescens virescens*, with which those from South Carolina, the type-locality, seem to be in all respects practically identical. Breeding birds from the mainland of Florida, from southern Alabama, southern Mississippi, and southern Texas are absolutely indistinguishable in color from examples taken in New York and Pennsylvania; but in size they average very slightly smaller. Specimens of a considerable series from the islands of the Dry Tortugas, Florida, off the southern end of the Florida peninsula, are scarcely smaller than those from the Florida mainland, but are mostly less bluish or glaucous green above; which difference, however, seems not to be of geographical significance, since it occurs more or less as an individual variation throughout the entire range of the species.

From southern Tamaulipas to Tabasco, along the eastern coast of Mexico, occur some birds which are darker than those of usual colors from the eastern United States; and which are, in the males, about

¹ M. Surber, spring (April to June), 1904, one seen.

unsatisfactory for subspecific recognition, because there are altogether too many individuals in each of these two series that are inseparable from individuals in the other. Furthermore, the resident birds of western Mexico, north along the coast as far, at least, as San Blas, Tepic, are, although averaging almost unappreciably paler below, practically the same, so far as we can discover, as those of New England; and the same is true of specimens available from southern Mexico, including Yucatan, from Guatemala, British Honduras, and Honduras. In size of both male and female, the birds from these Mexican and Central American localities are identical with those from Florida. The birds of all these localities, from Florida to Texas, Mexico, Guatemala, and Honduras, are seen to be really intermediate in size between *Butorides virescens virescens* and the Panama race hereinafter separated as *Butorides virescens hypnotus*;¹ and upon size (which is the only diagnostic character separating these two races) might with propriety be called either *B. v. virescens* or *B. v. hypnotus*; yet owing to the interruption of range, at least in western Nicaragua, caused by *Butorides virescens mesatus*,² they are seemingly better referred to the northern *Butorides virescens virescens*, at least until the status of the bird from eastern Nicaragua be determined. The identity of the form occurring on Ruatan Island, Honduras,³ and Cozumel Island, Yucatan,⁴ is somewhat doubtful, as we have seen no specimens from either locality, but the bird probably is that of the adjacent coast, that is, *Butorides virescens virescens*. The differences of size in various parts of the range of this subspecies may be readily appreciated from the following table of average measurements:

Localities.	Wing.	Tail. •	Ex- posed culmen.	Height of bill at base.	Tarsus.	Middle toe.
Fourteen males, from Pennsylvania, New Jersey, Maryland, District of Columbia, Virginia, and Kansas.....	181.1	66.5	60.9	12.1	53.0	45.0
Ten males, from Florida (mainland), southern Alabama, and southern Mississippi.....	178.7	67.2	61.7	11.4	51.4	45.0
Twelve males, from the Dry Tortugas, Florida.....	177.2	66.0	59.8	11.4	50.5	45.7
Three males, from southern Texas.....	178.7	66.3	63.2	12.2	52.2	45.3
Two males, from Tamaulipas and Vera Cruz.....	179.0	66.5	57.0	11.8	50.8	44.8
Four males, from Tepic, Colima, Guerrero, and Chiapas.....	176.8	64.5	63.2	11.9	53.0	45.8
Thirteen females, from New York, Pennsylvania, New Jersey, Maryland, Virginia, Indiana, Missouri, and Kansas.....	175.1	65.5	59.8	11.7	51.2	45.7
Nine females, from Florida (mainland) and southern Alabama.....	178.7	66.9	61.4	11.3	51.4	44.7
Two probable females, from the Dry Tortugas, Florida.....	160.5	61.0	58.3	11.0	48.8	44.0
One female, from southern Texas.....	163.0	62.0	60.0	11.3	48.8	43.5
Seven females, from Tamaulipas, Vera Cruz, and Tabasco.....	167.2	61.9	60.1	11.9	49.4	43.4
Three females, from Tepic, Guerrero, and Chiapas.....	170.0	65.0	62.3	11.8	52.7	45.0

¹ See p. 549.

² See p. 548.

³ Sharpe, Cat. Birds Brit. Mus., vol. 26, 1898, p. 190.

the northeastern United States the females average smaller than the males; on the Florida mainland they are equal in size; in eastern Mexico they are decidedly smaller; and in western Mexico they are, if the sex determinations be reliable, as is probable, somewhat larger.

In the northern part of its range, *Butorides virescens virescens* is only a summer resident, but in Florida, central and southern Mexico, Guatemala, Honduras, and British Honduras, it remains throughout the year. In central Florida it has been found breeding as early as April 4.

In the Bermuda Islands it appears only in winter and the seasons of migration, and, therefore, so far as known, does not breed. It does not regularly visit the West India Islands, the only record there being a single, apparently accidental, individual (No. 169016, U.S. N.M.) obtained by Mr. A. B. Baker, February 16, 1899, at Fajardo, Porto Rico.

The green heron of the eastern United States was first described by Linnæus as *Ardea virescens*,¹ from "America," with the following diagnosis: "A[rdea] occipite subcristato, dorso viridi, pectore rufescente." His account was based on the "*Ardea stellaris minor*" of Sloane;² the "*Ardea stellaris minor*" of Ray;³ and the "*Ardea stellaris minima*" of Catesby.⁴ The descriptions of Sloane and Ray, however, apply, without much doubt, exclusively to *Izobrychus exilis*, but Catesby's bird is the green heron, from "Virginia and Carolina."

Since Linnæus' diagnosis fits only the green heron, the name *Ardea virescens* should properly belong to that bird alone, notwithstanding the compositeness of the whole account. This makes Catesby's description⁵ the sole basis of the name, and since most of his birds came from the coast of South Carolina, it seems best to restrict the type-locality to that region, as I have done above.⁶ Two other names, *Ardea chloroptura* Boddaert⁷ and *Ardea ludoviciana* Gmelin,⁸ were founded on the bird from Louisiana, and, therefore, must be considered synonyms of *Butorides virescens virescens*.

Of this form 299 specimens have been examined, from the following localities, breeding records being indicated by an asterisk:

Alabama.—Mobile Bay,* Stevenson,* Montgomery,* Dothan.*

Connecticut.—Stamford.

District of Columbia.—Woodley Lane,* Washington,* Little River.*

¹ Syst. Nat., ed. 10, vol. 1, 1758, p. 144.

² Voyage to Islands of Madera, Barbadoes, Nieves, St. Christophers, and Jamaica, with natural history of those Islands (=Natural History of Jamaica), vol. 2, 1725, p. 315.

³ Syn. Meth. Avium et Piscium, 1713, p. 189, No. 2 (page No. 4).

⁴ Nat. Hist. Carolina, Florida, and Bahama Islands, vol. 1, 1731, p. 80, pl. 80.

⁵ Loc. cit.

⁶ See p. 534.

⁷ Tabl. Planch. Enlum., 1733, p. 54.

⁸ Syst. Nat., vol. 1, pt. 2, 1789, p. 630.

River,* Lake Kissimmee; Kissimmee; Fort Gardner (Kissimmee River); Lake Harney; Big Lake George; Hernando County (January); Tarpon Springs,* Dry Tortugas,* Micco (January 17); eastern peninsula, opposite Micco,* Florida Creek (February 22); Suwanee River; Suwanee River, Lafayette County; New Smyrna,* Amelia Island,* Eau Gallie (January 20, February 24); Fenholloway River; northern Brevard County.

Georgia.—Young Harris,* Nashville.

Illinois.—Mount Carmel; Rockland.

Indiana.—Vincennes,* English Lake.*

Iowa.—Winnebago County,* Lake Mills; Van Buren County, 5 miles northwest of Hillsboro.*

Kansas.—Western Kansas; Salt Creek,* Topeka.*

Maryland.—Laurel,* Cornfield Harbor,* Piney Point,* Washington Grove,* Frederick,* Hagerstown,* Kensington; Jefferson.

Massachusetts.—Hadley,* Melrose; Barnstable County,* Cambridge,* Concord.

Minnesota.—Fort Snelling.*

Mississippi.—Bay St. Louis.

Missouri.—Charleston,* Monteer (Shannon County).*

New Hampshire.—Hollis.*

New Jersey.—Princeton; Cape May; Beach Haven; Seven Mile Beach,* Haddonfield,* Squam Beach,* Plainfield,* Basking Ridge; Bound Brook; Orange,* Mount Ephraim.*

New York.—Oyster Bay,* Peterboro,* Hastings-on-Hudson,* Millers Place (Long Island),* Yonkers; Mount Hope,* Long Island City,* Shelter Island,* New York City,* Speonk; Bay Shore (Long Island),* Katonah,* Amityville,* Bath Beach (Long Island),* Alder Creek,* Princes Bay (Staten Island),* Pleasant Valley (Dutchess County); Good Ground (Long Island),* Mount Sinai (Long Island).*

North Carolina.—Bogue Bank; Fort Macon,* Hatteras.*

Ohio.—New Holland,* Berlin Heights.*

Oklahoma.—Sans Bois (Choctaw Country).

Pennsylvania.—Landisville,* Bristol,* McKees Gap,* Holmesburg (Philadelphia),* Chestnut Hill (Philadelphia),* Chester County,* Moscow (Lackawanna County),* Carlisle; Erie; Marple (Delaware County).*

Rhode Island.—Chepachet; Middletown; Pawtucket.*

South Carolina.—Porcher's Bluff (Christchurch Parish),* l'On Swamp (Christchurch Parish),* Wayne's Place (Christchurch Parish).*

Lomita.*

Virginia.—Smiths Island;* Four Mile Run; Arlington;* Matthews County.*

Chiapas.—Comitan; Tonala.*

Colima.—Manzanillo.

Guerrero.—Papayo.

Jalisco.—Ocotlan.

Mexico (State).—San Mateo.

Michoacan.—Patzcuaro.*

Tabasco.—Montecristo.

Tamaulipas.—Alta Mira;* Tampico.

Tepic.—San Blas.*

Vera Cruz.—Boca del Rio;* Orizaba; Plan del Rio; Mirador; Rivera; 15 miles south of Rivera; 75 miles south of Rivera; Isla de los Frijoles.

Yucatan.—Puerto Morelos.

British Honduras.—Belize.*

Guatemala.—Choctun (Vera Paz).

Honduras.—Ceiba.

Porto Rico.—Fajardo.

Measurements of specimens of Butorides virescens virescens.

* Used in measurement averages on p. 534.

Measurements of specimens of Butorides virescens virescens—Continued.

¹ Used in measurement averages on p. 534.

Museum and No.	Sex.	Locality.	Date.	Collector.	Wing.	Tail.	Exposed cul- men.	Height of bill at base.	Tarsus.	Middle toe.
U.S.N.M., 118433 ¹	Female.	Vincennes, Ind.	May 5, 1890	R. Ridgway..	176.0	66.0	62.0	12.0	52.0	45.5
M. C. Z., 42583 ¹.....	..do.....	Charleston, Mo.	May 12, 1879	W. S. Bryant..	170.0	68.5	56.0	12.3	50.5	47.0
M. C. Z., 15227 ¹.....	..do.....	Topeka, Kans.	May 22, 1871	.....	178.0	74.5	59.5	12.8	55.0	48.0
U.S.N.M., 207855.....	..do.....	Dothan, Ala.	June 6, 1911	A. H. Howell..	184.5	70.0	62.0	11.0	52.0	44.5
U.S.N.M., 176841.....	..do.....	Alligator Bluff, Kis- simmee River, Fla.	Apr. 26, 1901	E. A. Mearns..	178.0	65.0	64.0	11.0	52.0	46.5
U.S.N.M., 176845.....	..do.....	..do.....	Apr. 8, 1901	..do.....	176.0	65.0	64.0	11.0	50.0	44.0
U.S.N.M., 176752.....	..do.....	Lone Cab- bage Palm, Kissimmee River, Fla.	Apr. 6, 1901	..do.....	175.0	65.0	59.0	11.5	51.5	44.5
U.S.N.M., 176844.....	..do.....	..do.....	Apr. 4, 1901	..do.....	175.0	65.0	59.0	10.5	51.0	45.0
Am. Mus. N. H., 99480.....	..do.....	Fenholloway River, Fla.	Mar. 20, 1907	F. M. Chap- man.	174.0	65.0	61.0	11.8	55.0	45.5
Am. Mus. N. H., 26830.....	..do.....	Kissimmee, Fla.	Nov. 18, 1883	C. J. Maynard	185.0	68.5	63.0	12.2	51.5	44.5
J. Dwight, 13375.....	..do.....	Northern Brevard Co. Fla.	Mar. 23, 1905	W. W. Worth- ington.	176.5	67.5	62.0	11.5	49.5	43.5
J. Dwight, 16290.....	..do.....	Amelia Is- land, Fla.	Mar. 24, 1906	..do.....	184.0	71.0	58.5	11.0	50.5	44.5
Am. Mus. N. H., 49638.....	[?]	Dry Tortu- gas, Fla.	Apr. 11, 1890	F. S. Good- man.	161.0	61.0	58.5	11.0	46.5	45.0
Am. Mus. N. H., 49633.....	[?]	..do.....	Apr. 19, 1890	..do.....	160.0	61.0	58.0	11.3	45.0	43.0
Am. Mus. N. H., 79748.....	Female.	Lomita, Tex.	July 9, 1880	..do.....	163.0	62.0	60.0	11.3	48.0	43.5
Am. Mus. N. H., 79752.....	..do.....	Alta Mira, Tamaulipas, Mex.	May 17, 1888	..do.....	160.0	63.0	60.0	12.0	49.0	46.0
U.S.N.M., 193612.....	..do.....	75 miles south of Rivera, Vera Cruz, Mex.	Apr. 17, 1904	S. E. Piper, C. Sheldon, and L. C. Sanford.	174.0	66.0	63.0	11.9	51.5	45.0
U.S.N.M., 193615.....	..do.....	Rivera, Vera Cruz, Mex.	Apr. 13, 1904	..do.....	168.0	58.0	64.0	12.3	51.0	44.0
U.S.N.M., 193613.....	..do.....	..do.....	..do.....	..do.....	163.0	59.0	58.0	11.5	47.0	43.0
U.S.N.M., 193614.....	..do.....	..do.....	Apr. 27, 1904	..do.....	169.0	67.0	61.0	12.0	52.0	44.0
U.S.N.M., 193617.....	..do.....	Isla de los Frijoles, Vera Cruz, Mex.	Apr. 26, 1904	..do.....	166.5	60.0	56.0	11.5	47.5	42.5
U.S.N.M., 166354.....	..do.....	Montecristo, Tabasco, Mex.	May 7, 1900	E. W. Nelson and E. A. Goldman.	170.0	60.0	58.5	12.0	48.0	39.0
U.S.N.M., 185420.....	..do.....	Papayo, Gu- errero, Mex.	Apr. 20, 1903	..do.....	177.0	62.0	64.0	11.5	52.5	44.5
U.S.N.M., 193841.....	..do.....	Comitan, Chiapas, Mex.	Mar. 29, 1904	..do.....	180.0	66.0	60.5	12.0	53.0	46.0
J. Dwight, 24009.....	..do.....	San Blas, Tepec, Mex.	Apr. 8, 1909	P. I. Osburn..	180.0	67.0	62.5	12.0	52.5	44.5
A. N. S. Phila., 26034.....	..do.....	Winnebago County, Iowa.	Aug. 15, 1881	W. L. Abbott.	183.0	67.5	59.5	12.0	50.5	44.5
U.S.N.M., 4154.....	..do.....	Brownsville, Tex.	.....	S. Van Vleet..	172.0	68.5	60.0	11.7	.....	.....
U.S.N.M., 130817.....	..do.....	Yucatan .....	.....	G. F. Gummer.	177.0	62.5	62.0	11.0	51.0	46.0
U.S.N.M., 130815.....	..do.....	..do.....	..do.....	..do.....	171.5	63.0	60.0	11.5	49.5	45.0
U.S.N.M., 130319.....	..do.....	..do.....	..do.....	..do.....	169.5	62.5	62.5	12.2	53.0	48.5
U.S.N.M., 130318.....	..do.....	..do.....	..do.....	..do.....	171.0	62.0	60.5	12.0	47.0	44.0
U.S.N.M., 28068.....	..do.....	Mirador, Vera Cruz, Mex.	.....	C. Sartorius..	171.0	63.5	58.5	10.5	51.0	43.0
M.C.Z., 31778.....	..do.....	Orizaba, Vera Cruz, Mex.	.....	P. M. Toro...	175.0	63.0	61.0	12.0	53.0	47.0

¹ Used in measurement averages on p. 534.

² "Male" on the label of the specimen, but this is probably wrong.

Chars. subsp..—Resembling *Butorides virescens virescens*, but hind neck, sides of neck, and foreneck, darker, more purplish, less maroon; breast and posterior lower parts darker; edgings of superior wing-coverts darker; upper surface of body averaging duller and more deeply colored; average size very slightly greater.

Measurements.—Male:¹ Wing, 176–189 (average, 183.2) mm.; tail, 63–72.5 (69.2); exposed culmen, 60.5–66.5 (63.7); height of bill at base, 11–13.5 (12.3); tarsus, 51–58 (53.8); middle toe, 44–48.5 (47.3).

Female:² Wing, 176.5–182.5 (180.0); tail, 66.5–73.5 (70.0); exposed culmen, 62.5–66.5 (64.9); height of bill at base, 12–13 (12.5); tarsus, 51–56 (52.9); middle toe, 46–47.5 (46.8).

Type-locality.—La Paz, Lower California, Mexico.

Geographical distribution.—Southern and central Lower California: south to La Paz, southern Lower California; and north to San Ignacio, central Lower California.

The juvenal plumage is very deeply colored, particularly on the lower parts, and differs from the corresponding stage of *Butorides virescens virescens* in its darker hind neck, foreneck, sides of neck, and streaks of lower parts.

In the series of adults examined the colors are very uniform. The female averages somewhat smaller than the male. This race occupies a restricted area in southern and central Lower California, where it is apparently resident throughout the year. Its center of distribution appears to be the vicinity of La Paz Bay, but it has occurred as far north as San Ignacio, in the central portion of the peninsula (north and south); and a single adult male from the latter locality (No. 196339, U.S.N.M.), taken October 11, 1905, by Messrs. E. W. Nelson and E. A. Goldman, is practically typical.

Fourteen specimens examined, from the localities below, breeding records being indicated by an asterisk:

Lower California.—La Paz,* San Ignacio; San Jose Island,* Puerto Balandra.

¹ Ten specimens, from southern Lower California.

² Four specimens from southern Lower California.

BUTORIDES VIRESCENS ANTHONYI (Mearns).

Ardea virescens anthonyi MEARNS, Auk, vol. 12, July, 1895, p. 257 (Seven Wells, Lower California).

Chars. subsp..—Similar to *Butorides virescens virescens*, but much larger; posterior lower parts much paler; foreneck more cinnamonaceous or fulvescent; upper surface of body and hind neck lighter, the green of body duller, the chestnut of neck more fulvescent.

Measurements.—Male: ³ Wing, 186–202 (average, 196) mm.; tail, 67–79 (72.8); exposed culmen, 57.8–64 (61.0); height of bill at base, 11–13.5 (12.3); tarsus, 51–56.5 (53.9); middle toe, 43.5–49 (47.7).

Female: ⁴ Wing, 180–196 (189.7) mm.; tail, 63–74.5 (69.6); exposed culmen, 57–62 (60.2); height of bill at base, 10.5–13 (11.8); tarsus, 48–54.5 (52.5); middle toe, 43–48 (45.5).

Type-locality.—Seven Wells, Salton River, northern Lower California, Mexico.

Geographical distribution.—Southwestern United States and through Mexico to Costa Rica: in summer, north to Fort Klamath, Oregon; and Big Sandy, Arizona; east to Murphy and Little Owens Lake, east central California; Camp Verde, central Arizona; and Bisbee, southeastern Arizona; south to the San Bernardino River and the San Pedro River, northern Sonora; and Seven Wells, Salton River, northern lower California; west to Los Coronados Islands, northwestern Lower California; Santa Barbara, Ukiah, and Yreka, western

¹ Used in measurement averages on p. 542.

² Lower California, Mexico.

³ Fifteen specimens, from California, Arizona, northern Sonora, and northern Lower California.

⁴ Eleven specimens, from California, Arizona, northern Lower California, and Costa Rica.

California. In migration east to Victoria, central Tamaulipas; in winter from southern Lower California and central Mexico south to El Limon, western Guerrero; Tehuantepec, southeastern Oaxaca; and San José, central Costa Rica.

This is one of the best characterized forms of the species. From *Butorides virescens frazari* it differs as from *Butorides virescens virescens*, only much more strongly. Freshly molted or winter birds are sometimes rather dark, but the cinnamonaceous or rufous tint of the neck, coupled with large size, easily distinguishes such specimens. The female is decidedly smaller than the male. The young in juvenal plumage may be distinguished from that of *Butorides v. virescens* by reason of its paler, more grayish or brownish upper body surface; lighter, more cinnamon rufous hind neck and foreneck; and paler lower parts with narrower and less numerous streaks.

Birds from central California seem to be identical in color with those from Arizona; also in size, as the following comparison of average measurements indicates:

Localities.	Wing.	Tail.	Ex- posed culmen.	Height of bill at base.	Tarsus.	Middle toe.
Eleven males, from Arizona, Sonora, Lower California, and extreme southeastern California.....	mm. 196.3	mm. 72.9	mm. 60.8	mm. 12.2	mm. 53.3	mm. 47.1
Four males, from central California.....	195.5	72.8	61.8	12.7	55.4	46.6
Nine females, from Arizona, Lower California, Costa Rica, and extreme southeastern California.....	189.9	70.3	60.3	11.8	52.6	45.7
Two females, from central California.....	189.0	66.5	59.8	12.0	52.0	45.4

There are published records from northern Oregon and from Washington, but I have seen no specimens, and these records seem somewhat doubtful. This subspecies is only a summer sojourner in the United States, and retires to central and southern Mexico to pass the winter, where it remains, at least sometimes, until the beginning of April. A single adult female (No. 16376, collection of A. E. and O. Bangs), taken by Mr. C. F. Underwood, on November 27, 1896, in the vicinity of San José, Costa Rica, must be regarded as a straggler, for this subspecies is otherwise not known south of Mexico.

Specimens to the number of 70 have been seen, from the subjoined localities, breeding records being indicated by an asterisk:

Arizona.—Big Sandy Creek;* Johnston's Ranch, 7 miles south of Bisbee; San Bernardino Ranch (Mexican boundary line); Phoenix;* Fort Verde;* Beaver Creek (Fort Verde);* Gila River at mouth of San Carlos River; Verde River.*

California.—Sacramento;* Unlucky Lake (San Diego County);* Red Bluff;* Stockton; Yreka;* Yuma; Escondido; Biggs (Butte County);* Marysville;* Tulare Lake;* Berryessa; San Gabriel.

Lower California.—Seven Wells, Salton River;* Gardner's Laguna;* San Quintin; San Fernando; San Ignacio; San Jose del Cabo (January 8).

Mexico (State).—Valley of Mexico.

Michoacan.—Los Reyes (February 18); Tupátaro.

Oaxaca.—Tehuantepec.

Sonora.—San Pedro River (near the United States boundary line);* San Bernardino River (near the United States boundary line).

Tamaulipas.—Victoria.

Vera Cruz.—Orizaba.

Costa Rica.—Vicinity of San José.

Measurements of specimens of Butorides virescens anthonyi.

¹ Used in measurement averages on p. 543.

² Type; original number, 10623.

white and dark brown; breast, sides, and axillars rather light gray, about No. 7,¹ with a slight brownish tinge; abdomen and crissum much paler gray, somewhat mixed with whitish, particularly on latter, which have slate-colored terminal or subterminal spots or blotches; thighs pale gray, with an ochraceous tinge exteriorly; lining of wing mottled pale gray and white, with a slight buffy wash, the edge of wing broadly white.

Measurements.—Male:² Wing, 181–183 (average, 182) mm.; tail, 65–67.5 (66.3); exposed culmen, 57.5–63 (60.3); height of bill at base, 11–12.5 (11.8); tarsus, 51.5–52.5 (52); middle toe, 46.5–48 (47.3).

Female: Wing,³ 182 mm.; tail, 65; exposed culmen, 54; height of bill at base, 12; tarsus, 50; middle toe, 46.

Type-locality.—San Diego, Chihuahua, Mexico.

Geographical distribution.—Northern central Mexico: north to San Diego, central Chihuahua; south to Rio Sestín, northwestern Durango; and in winter to Los Reyes, western Michoacan.

The present form is distinguishable from *Butorides virescens virescens* by its much paler posterior lower parts, and more maroon tinged, less purplish, and somewhat lighter neck and sides of head. Although we have examined only a small number of specimens, the characters exhibited by them seem to separate them subspecifically from both *Butorides virescens virescens* and *Butorides virescens anthonyi*, the forms which are geographically nearest. A single immature female (No. 185244, U.S.N.M.) from Los Reyes, Michoacan, taken February 12, 1903, is apparently of this race, indicating its probable winter range.

Three specimens have been available, from the following places, breeding birds with an asterisk:

Chihuahua.—San Diego.*

Durango.—Rio Sestín.*

Michoacan.—Los Reyes (February 12).

Measurements of specimens of Butorides virescens eremonomus.

Museum and number.	Sex.	Date.	Wing.	Tail.	Ex- posed cul- men.	Height of bill at base.	Tarsus.	Middle toe.
U.S.N.M., 124540 ⁴	Male ⁵	June 11, 1891	mm. 181.0	mm. 67.5	mm. 63.0	mm. 12.5	mm. 51.5	mm. 46.5
Am. Mus. N. H., 91909 ⁶	do ⁶	May 3, 1903	183.0	65.0	57.5	11.0	52.5	48.0
U.S.N.M., 185244 ⁷	Female, juvenile. ⁷	Feb. 12, 1903	182.0	65.0	54.0	12.0	50.0	46.0

¹ Of Mr. Ridgway's Nomenclature of Colors, 1836.

² Two specimens, from Chihuahua and Durango.

³ One specimen, from Michoacan, Mexico.

⁴ Used in measurement averages on p. 547.

⁵ Type, from San Diego, Chihuahua, Mexico, collected by F. Robinette.

⁶ From Rio Sestín, Durango, Mexico, collected by J. H. Batty.

⁷ From Los Reyes, Michoacan, Mexico, collected by E. W. Nelson and E. A. Goldman.

and tail shorter; neck, sides of head, and posterior lower parts paler.

Description.—Type, adult female, No. 151366, U.S.N.M.; Managua, Nicaragua; Charles E. Kern. Pileum, occipital crest, postocular region, and a short subauricular streak, deep, glossy bottle green; malar stripe buffy white; submalar stripe chestnut* mixed with blackish brown; cheeks, auriculars, sides and back of neck, chestnut, more rufescent and paler anteriorly, more purplish posteriorly; upper surface of body deep bottle green, somewhat glossy, the long, pointed, plume-like feathers of back and scapulars somewhat glaucous bluish; wings fuscous, the primaries and outer secondaries dull, dark, greenish-blue slate color, the inner primaries and outer secondaries tipped with white; tertials, outer webs of inner secondaries, with greater, median, and lesser wing-coverts, dark, glossy bottle green; the first rows of lesser wing-coverts margined rather narrowly with tawny, the other rows and the median coverts with ochraceous buff, the greater coverts and outer webs of tertials and innermost secondaries with buff or cream white; tail fuscous, all the exposed portions, except the middle feather, glossy bottle green; chin and middle of upper throat white, medially rather sparingly streaked with dark brown; jugulum purplish chestnut, a little lighter than the hind neck, conspicuously and broadly streaked with white, and slightly with dull, dark brown; breast, sides, crissum, and axillars, smoke gray; abdomen and crissum paler gray, even whitish; longest under tail-coverts with dark brownish gray distal markings; thighs pale brownish gray; lining of wing pale gray, mottled with white, ochraceous, and buff, the edge of wing broadly cream white.

Measurements.—Male:¹ Wing, 169 mm.; tail, 63; exposed culmen, 61.5; height of bill at base, 12.5; tarsus, 49; middle toe, 44.

Female:² Wing, 164; tail, 61; exposed culmen, 62; height of bill at base, 12.5; tarsus, 50.5; middle toe, 44.5.

Type-locality.—Managua, Nicaragua.

Geographical distribution.—Western Nicaragua, probably north to Momotombo, and probably south to Ometepe and San Juan del Sur.

From *Butorides virescens anthonyi* it may be separated by much shorter wing and tail, somewhat paler posterior lower parts, and more purplish (less fulvescent) neck; and from *Butorides virescens virescens* by shorter wing, much lighter posterior under parts, and paler, more maroon tinged (less purplish) neck. A specimen in juvenal plumage is apparently indistinguishable from juvenal examples of *Butorides virescens anthonyi*.

¹ One specimen, from western Nicaragua.

² One specimen (the type), from western Nicaragua.

The only adults examined are from Managua, in western Nicaragua, but it is fair to assume that this is the form of all western Nicaragua, where it is apparently resident, at least as far north as Momotombo,¹ and as far south as Ometepe Island² and San Juan del Sur,³ possibly even to the Bay of Salinas,⁴ in extreme northwestern Costa Rica. To what form, however, belong the birds from eastern Nicaragua, whence records exist of some green heron, at the Escondido River⁵ and the Bluefields River,⁶ it is unsafe to hazard a guess, and the examination of specimens must decide. It may be the present form, or *Butorides virescens virescens*, or even *Butorides virescens hypnотotius*.⁷

Only three specimens have been seen, both from Managua, Nicaragua.

Measurements of specimens of Butorides virescens mesatus.

Museum and number.	Sex.	Collector.	Wing.	Tail.	Ex- posed culmen.	Height of bill at b se.	Tarsus.	Middle toe.
U.S.N.M., 151365 ^a	Male ^a	C. E. Kern....	169.0	63.0	61.5	12.5	49.0	44.0
A. N. S. Phila., 26590.....	Male, juvenile ^b	.....	174.0	65.0	57.5	10.8	55.0	46.0
A. N. S. Phila., 151366 ^c	Female ¹¹ ..	C. E. Kern....	164.0	61.0	62.0	12.5	50.5	44.5

BUTORIDES VIRESCENS HYPERNOTIUS, new subspecies.

Chars. subsp.—Like *Butorides virescens virescens*, but wing, tail, and tarsus of male shorter; barely distinguishable in color, but posterior lower parts averaging slightly paler; neck slightly less purplish.

Description.—Type, adult male, No. 206342, U.S.N.M., Biological Survey collection; Rio Indio, near Gatun, Canal Zone, Panama, February 16, 1911; E. A. Goldman; original number, 13736. Pileum, occipital crest, postocular region, and a short subauricular streak, deep, glossy bottle green; malar stripe buff; submalar stripe black and purplish maroon; cheeks, auriculars, sides and back of neck, purplish maroon, somewhat more rufescent anteriorly, somewhat glaucous posteriorly; upper surface of body deep bottle green, rather glossy, the long, pointed, plume-like feathers of back and scapulars more oily green and a little glaucous; wings fuscous, the primaries and outer secondaries dull, dark, greenish-blue slate color, the inner primaries and outer secondaries narrowly tipped with white; tertials,

¹ Sharpe, Cat. Birds Brit. Mus., vol. 26, 1896, p. 190.

² Ridgway, Proc. U. S. Nat. Mus., vol. 6, 1883 (1884), p. 396.

³ Idem, p. 379.

⁴ Salvin and Godman, Biol. Cent. Amer., Aves., vol. 3, 1901, p. 170.

⁵ Richmond, Proc. U. S. Nat. Mus., vol. 16, 1893, p. 527.

⁶ Selater and Salvin, Proc. Zool. Soc. London, 1867, p. 280.

⁷ See p. 549.

^a Used in measurement averages on p. 548.

^b From Managua, Nicaragua.

^c From Nicaragua.

¹¹ Type, also from Managua, Nicaragua.

both probably unusually large examples of *Butorides virescens hypernotius*; at least, it seems best to consider them such, rather than as migrant individuals of *Butorides virescens virescens*.

The specimens from Costa Rica, Colombia, and Venezuela examined are, in both size and color, apparently just like those from Panama. Average measurements of birds from these regions are as follows:

Localities.	Wing.	Tail.	Ex- posed culmen.	Height of bill at base.	Tarsus.	Middle toe.
	mm.	mm.	mm.	mm.	mm.	mm.
Five males, from Panama.....	173.7	62.5	59.4	11.4	50.1	44.9
Three males, from Colombia and Venezuela.....	173.0	64.8	61.7	11.9	50.2	45.2
Six males, from Costa Rica.....	172.7	63.4	61.4	12.3	50.8	45.3
Five females, from Panama.....	171.7	65.1	59.4	11.8	50.7	43.9
One female, from Costa Rica.....	175.0	71.5	57.3	11.0	48.0	43.0

This form is apparently resident throughout most, if not all, of its range, although, heron-like, it probably wanders more or less before and after the breeding season. It is possible, however, that in the southernmost part of its distribution it is migratory, for there are records of its occurrence in southern South America; yet these need confirmation.

I have seen 28 examples, from the localities below, breeding records having an asterisk:

Colombia.—Honda (Tolima); Mamatoca; Bonda (Santa Marta).

Costa Rica.—Vicinity of San Jose; Talamanca; Pozo del Rio Grande (Boruca); Bolson; Lipurio; Azahar de Cartago.

Panama.—Rio Indio, near Gatun (Canal Zone); Gatun; Frijoles; Rio Caño Quebrado (near Tabernilla); Sona.*

Venezuela.—Chama (near Merida); Rio Muenpen (near Merida).

Museum and number.	Sex.	Locality.	Date.	Collector.	Wing.	Tail.	Exposed cul- men.	Height of bill at base.	Tarsus.	Middle toe.
U.S.N.M., 206346 ¹	Male	Gatun, Canal Zone, Panama.	Feb. 26, 1911	E. A. Goldman.	172.0	63.0	58.5	11.8	51.5	43.5
U.S.N.M., 206342 ¹.....	...do.....	Rio Indio, near Gatun, Canal Zone, ³ Panama.	Feb. 16, 1911	...do.....	176.0	61.0	56.0	11.5	52.5	45.5
U.S.N.M., 206345 ¹	Male ....	...do.....	Feb. 8, 1911	...do.....	170.0	60.5	56.0	11.0	49.5	47.0
E. A. and O. Bangs, 8902. ¹	Male	Sona, Panama.	July 12, 1901	W. W. Brown, Jr.	176.5	63.0	60.5	11.2	46.5	43.5
Am. Mus. N. H., 107108 ¹	[Male]...	Near Gatun, Canal Zone, Panama.	Oct. 12, 1908	T. Hallinan.	174.0	65.0	61.0	11.5	50.5	45.0
U.S.N.M., 67921 ¹	Male	Talamanca, Costa Rica.	.....	W. M. Gabb.	175.0	67.5	63.0	13.0	52.0	47.0
E. A. and O. Bangs, 19233. ¹	...do.....	San Jose, Costa Rica.	Dec. 10, 1906	C. F. Underwood.	174.0	64.0	57.5	12.0	51.0	48.0
E. A. and O. Bangs, 16378. ¹	...do.....	Vicinity of San Jose, Costa Rica.	Feb. 19, 1896	...do.....	168.0	61.0	58.5	11.5	51.0	45.5
E. A. and O. Bangs, 20845. ¹	...do.....	Bolson, Costa Rica.	Dec. 23, 1907	...do.....	171.5	62.0	62.8	12.3	48.0	43.0
E. A. and O. Bangs, 17975. ¹	...do.....	Pozo del Rio Grande, Boruca, Costa Rica.	Apr. 4, 1906	...do.....	177.0	67.0	62.5	12.8	53.0	43.5
E. A. and O. Bangs, 17976. ¹	...do.....	...do.....	Apr. 11, 1906	...do.....	171.0	59.0	64.0	12.2	50.0	45.0
Am. Mus. N. H., 94799 ¹	...do.....	Honda, Tolima, Colombia.	Jan. 27, 1907	Mrs. E. L. Kerr.	175.0	66.5	61.5	12.0	48.5	43.0
Am. Mus. N. H., 97887 ¹	...do. ²	Mamatoca, Santa Marta, Colombia.	Oct. 20, 1899	Mrs. H. H. Smith.	169.0	58.5	55.1	12.0	50.0	44.0
J. Dwight, 24009 ¹.....	...do.....	Chama, near Merida, Venezuela.	Apr. 20, 1903	S. B. Galdon.	175.0	66.5	62.0	11.7	52.0	43.5
U.S.N.M., 206344 ¹	Female	Rio Indio, near Gatun, Canal Zone, Panama.	Feb. 13, 1911	E. A. Goldman.	167.0	60.0	56.0	12.0	51.0	40.0
U.S.N.M., 206340 ¹.....	...do.....	...do.....	...do.....	...do.....	173.0	68.0	61.0	12.0	51.8	46.0
U.S.N.M., 206341 ¹.....	...do.....	...do.....	Feb. 19, 1911	...do.....	180.5	68.0	61.1	12.2	50.0	44.3
U.S.N.M., 206343 ¹.....	...do. ²	...do.....	Feb. 23, 1911	...do.....	158.0	64.0	65.5	12.2	48.5	40.3
U.S.N.M., 206347 ¹.....	...do.....	Rio Caño Quebrado, near Tabernilla, Canal Zone, Panama.	Apr. 9, 1911	...do.....	180.0	65.5	56.3	11.1	52.0	43.0
E. A. and O. Bangs, 20846. ¹	...do.....	Costa Rica	.....	C. F. Underwood.	175.0	71.5	57.3	11.0	46.0	43.0
Am. Mus. N. H., 45732.	.....	Panama.	.....	J. McLeannan and J. R. Galbraith.	166.0	63.0	61.0	11.1	55.1	54.5

¹ Used in measurement averages on page 550.

² Type.

³ Not quite adult.

BUTORIDES VIRESCENS SATURATUS Ridgway.

Butorides saturatus RIDGWAY, Proc. U. S. Nat. Mus., vol. 10, August 6, 1888, p. 577 (Swan Island, Caribbean Sea).

Chars. subsp.—Resembling *Butorides virescens frazari*, but differs in the more reddish (less purplish) shade of foreneck, hind neck, sides of head, and particularly of jugulum and breast; also in the restriction of the whitish median stripe on the foreneck posterior to the upper throat.

Measurements.—Probable male:¹ Wing, 179 mm.; tail, 67; exposed culmen, 60.5; height of bill at base, 11.2; tarsus, 48.5; middle toe, 44.5.

Type-locality.—Swan Island, Caribbean Sea, Honduras.

Geographical distribution.—Swan Islands, Caribbean Sea, Honduras.

In both size and color this subspecies is nearest *Butorides virescens frazari*. It differs materially from *Butorides virescens virescens* in its darker plumage throughout, including upper surface and edgings of superior wing-coverts; and in restriction of median light stripe on jugulum and upper breast. It has longer wings and tail than *Butorides virescens hypnотius*, and in color is separable from the latter as from *Butorides virescens virescens*.

The type is the only specimen known, but this form is doubtless resident and endemic on the Swan Islands.

BUTORIDES VIRESCENS MARGARITOPHILUS, new subspecies.

Chars. subsp.—Similar to *Butorides virescens hypnотius*, but smaller throughout, particularly the wing, tail, and exposed culmen; posterior lower parts darker; neck and sides of head more rufescent (less purplish); median white stripe on throat, jugulum, and breast much reduced, often almost obliterated on breast and jugulum, giving thus a much less streaked appearance to the anterior lower parts; center of throat often tinged with ochraceous, instead of being pure white as in *Butorides virescens hypnотius*.

Description.—Type, adult male, No. 200442, U.S.N.M.; San Miguel Island, Pearl Islands, Bay of Panama, Panama, March 13, 1904; Wilmot W. Brown, jr. Pileum, occipital crest, postocular region, and a short subauricular streak, deep, glossy bottle green; narrow malar stripe tawny ochraceous; submalar stripe purplish maroon mixed with blackish; cheeks, auriculars, and neck all around purplish maroon, somewhat more rufescent anteriorly, somewhat glaucous posteriorly, the foreneck very narrowly and sparingly streaked medially with white, and also broadly though inconspicuously with dull, dark brown; upper surface of body deep bottle green, somewhat glossy, the long, pointed, plume-like feathers of back and scapulars glaucous and somewhat bluish; wings fuscous, the primaries and outer secondaries dull, dark, greenish-blue slate color; tertials, outer webs of inner secondaries, with the superior wing-coverts, dark, glossy bottle green; the first rows of lesser wing-coverts margined rather narrowly all around with tawny ochraceous, the remaining rows and the median coverts with buff, the greater coverts and outer webs of tertials and innermost secondaries with white; tail dark, glossy bottle green; chin and middle of upper throat narrowly light tawny ochraceous, the former very sparingly, the latter heavily, streaked with blackish; breast and entire posterior lower parts,

¹ One specimen (the type, No. 111281, U. S. N. M.), from Swan Island, Caribbean Sea, collected March 6, 1887, by Mr. Charles H. Townsend (original number, 1818).

axillars, and under wing-coverts, brownish slate color, the longest lower tail-coverts with paler edgings, the thighs exteriorly dark, rufescent brown; edge of wing broadly creamy white.

Measurements.—Male:¹ Wing, 160–174.5 (average, 166) mm.; tail, 56–66 (60.7); exposed culmen, 54–60 (57.0); height of bill at base, 10.5–12 (11.0); tarsus, 44–49 (47.3); middle toe, 40–45 (42.8).

Female:² Wing, 157–169 (161.9) mm.; tail, 53–64 (59.3); exposed culmen, 54–59 (56.2); height of bill at base, 10.7–12 (11.1); tarsus, 42.5–47 (45.3); middle toe, 40–43 (41.2).

Type-locality.—San Miguel Island, Pearl Islands, Bay of Panama, Panama.

Geographical distribution.—San Miguel Island, and probably also other of the Pearl Islands, Bay of Panama, Panama.

This Pearl Islands race differs in color from *Butorides virescens virescens* as from *Butorides virescens hypenotius*, and in size even more markedly. From *Butorides virescens saturatus* it may be distinguished by its smaller size, lighter colors throughout, including upper parts, tail, and edgings of superior wing-coverts; lighter, more rufescent (less purplish) neck and sides of head. It resembles *Butorides virescens frazari*, but is much smaller, with less deeply colored posterior lower parts; lighter, more rufescent (less purplish) neck and sides of head, and differs otherwise as from *Butorides virescens hypenotius*.

The two juvenal birds examined differ from the corresponding plumage of *Butorides virescens hypenotius* in their paler, duller, more grayish upper parts, and lighter streaks on lower surface.

Messrs. Thayer and Bangs have already commented at length³ on the considerable individual variation in the series of birds from the Pearl Islands. Notwithstanding this variation, these birds represent a very distinct subspecies, as comparison of the series available readily shows. The female averages somewhat smaller than the male, chiefly in length of wing.

In the above described⁴ extreme adult plumage, *Butorides virescens margaritophilus* curiously and closely resembles the adult of *Butorides brunescens*, from Cuba, but is somewhat less brownish on the posterior lower surface; has the edgings of superior wing-coverts much paler, on greater coverts even whitish, and thus much more conspicuous; and, most important of all, has always a broad and conspicuous white edge to the wing, and at least an indication of the light median gular and jugular stripe, which is entirely absent in *Butorides brunescens*; and the median part of throat as well as of chin trenchantly and con-

¹ Twelve specimens, from San Miguel Island, Pearl Islands, Panama.

² Nine specimens, from the same island.

³ Bull. Mus. Comp. Zool., vol. 46, No. 8, September, 1905, pp. 142–144.

⁴ See p. 553.

throat and neck being practically unicolor. Furthermore, the young of *Butorides virescens margaritophilus* is pale and streaked below like that of *Butorides virescens virescens*, instead of dark brown almost uniform, as in *Butorides brunescens*.

I have seen specimens of this new subspecies from only San Miguel Island, where it is doubtless resident throughout the year, as the dates on the labels range from February 21 to May 4. It probably occurs on the other Pearl Islands also. What form of *Butorides virescens* occurs on Cocos Island, southwest of Panama, whence came a single specimen taken January 26, 1902,¹ we have not been able to determine. That it will prove to be the same as either *Butorides virescens margaritophilus* or *Butorides virescens hypernotius* seems less likely than that it is an undescribed race.

Of this subspecies 22 specimens have been examined, all from San Miguel Island, Panama.

*Measurements of specimens of Butorides virescens margaritophilus.*²

Museum and number.	Sex.	Date.	Wing.	Tail.	Ex- posed cul- men.	Height of bill at base.	Tar- sus.	Middle toe.
U.S.N.M., 200443 ³	Male.....	Feb. 29, 1904	165.0	59.0	55.5	11.0	48.5	42.0
U.S.N.M., 200442 ³	Mar. 13, 1904	165.0	61.5	59.5	10.5	46.5	42.5
E. A. and O. Bangs, 14264 ³	Mar. 10, 1904	164.5	59.0	56.5	12.0	45.0	42.0
M. C. Z., 40357 ³	Mar. 11, 1904	160.0	56.0	60.0	11.0	49.0	43.0
E. A. and O. Bangs, 14260 ³	Mar. 12, 1904	164.0	60.0	58.0	11.0	49.0	44.0
E. A. and O. Bangs, 14263 ³	Mar. 14, 1904	169.5	61.0	57.8	11.0	48.0	43.5
E. A. and O. Bangs, 14262 ³	Mar. 15, 1904	170.0	62.0	58.0	10.5	48.5	43.5
E. A. and O. Bangs, 14265 ³	Mar. 17, 1904	174.5	66.0	56.5	11.0	49.0	45.0
M. C. Z., 40361 ³	164.0	62.5	58.0	10.8	44.0	40.5
M. C. Z., 40362 ³	Mar. 18, 1904	167.5	62.0	64.0	11.0	46.5	43.0
E. A. and O. Bangs, 14261 ³	Mar. 19, 1904	167.0	62.0	56.3	11.3	47.8	45.0
E. A. and O. Bangs, 4831 ³	May 4, 1900	160.0	57.5	64.0	11.2	45.8	40.0
E. A. and O. Bangs, 14268 ³	Female.....	Feb. 21, 1904	159.0	60.0	59.0	11.0	45.5	40.0
M. C. Z., 40355 ³	158.0	60.5	54.5	10.8	44.0	40.5
E. A. and O. Bangs, 14266 ³	Feb. 29, 1904	161.5	59.5	54.5	12.0	43.5	41.5
M. C. Z., 40356 ³	Mar. 3, 1904	157.0	53.0	64.0	10.8	45.5	40.0
E. A. and O. Bangs, 14269 ³	Mar. 6, 1904	159.0	57.5	55.5	10.7	47.0	40.5
E. A. and O. Bangs, 14267 ³	Mar. 11, 1904	161.0	59.5	55.0	11.0	42.5	40.5
M. C. Z., 40358 ³	Mar. 12, 1904	163.0	59.5	56.5	11.0	46.0	41.5
M. C. Z., 40359 ³	Mar. 13, 1904	169.0	60.5	59.0	11.2	47.0	43.0
M. C. Z., 40360 ³	Mar. 15, 1904	166.5	64.0	58.0	11.0	47.0	43.0

BUTORIDES VIRESCENS BAHAMENSIS (Brewster).

Ardea bahamensis BREWSTER, Auk, vol. 5, January, 1888, p. 83 (Watling Island, Bahama Islands).

Chars. subsp.—Much like *Butorides virescens anthonyi*, but very much smaller throughout; posterior lower parts, neck, and sides of head even paler.

¹ Beck, Condor, vol. 9, 1907, p. 110.

² All of these specimens were collected by W. W. Brown, Jr., on San Miguel Island, Pearl Islands, Panama.

³ Used in measurement averages on p. 554.

⁴ Not quite adult.

base, 10.2–12.8 (11.3); tarsus, 42.5–51 (45.3); middle toe, 38–41 (39.5). Female:² Wing, 156–164 (160.1); tail, 58–63 (59.9); exposed culmen, 53.5–61 (56.7); height of bill at base, 11–12.2 (11.6); tarsus, 46–48 (47.1); middle toe, 39–41 (40.0).

Type-locality.—Watling Island, Bahama Islands.

Geographical distribution.—Bahama Islands: Abaco, Acklin, Berry, Bimini, Cay Lobos, Eleuthera, Great Inagua, Green Cay, Little Abaco, Long, Mangrove Cay (near Andros Island), Mariguana, New Providence, Northern Andros, Samana, Southern Andros, Strangers Cay, Rum Cay, Watling, and doubtless other islands.

This pale race is very different from *Butorides virescens virescens*, being very much smaller, especially in length of wing, and much lighter in color throughout. It is more nearly like *Butorides virescens eremomus*, of northern Mexico, but is much smaller throughout, and averages paler, particularly on neck and sides of head, with the neck more fulvescent. It is similar also to *Butorides virescens mesatus*, but is smaller in all measurements, with paler neck and sides of head. The juvenal plumage of *Butorides virescens bahamensis* is like that of *Butorides virescens anthonyi*.

The adult female is of about the same size as the male. The neck in some fresh plumaged birds is much darker and less fulvescent, and the posterior lower parts darker, thus approaching some light examples of *Butorides virescens cubanus*.³ There is great variation in the shade of the neck, probably due in part to age and to wear of the feathers, younger birds being usually somewhat paler.

So far as I can discover, all the birds from the various islands of the Bahama Archipelago are identical in both size and color, and this race probably occurs on most if not all of the islands in the group. It is confined to the Bahama Islands, being resident there throughout the year.

Nineteen specimens have been handled, from the subjoined localities, breeding records being marked with an asterisk:

Bahama Islands.—Watling Island;* Rum Cay;* Northern Andros Island;* Southern Andros Island;* Alfred Sound (Great Inagua Island); southern side of New Providence Island;* Abaco Island; Mangrove Cay (near Andros Island);* Strangers Cay.*

¹ Ten specimens, from the Bahama Islands.

² Four specimens, from the same group of islands.

³ See p. 557.

Museum and number.	Sex.	Locality.	Date.	Collector.	Wing.	Tail.	Exposed cul- men.	Height of bill at base.	Tarsus.	Middle toe.
U.S.N.M., 108819 ¹	Male ² ...	Watling Is- land. ³	Mar. 8, 1886	.....	159.0	58.0	56.0	11.8	47.5	38.5
U.S.N.M., 108001 ¹	do.....	do.....	do.....	W. Nye.....	165.0	61.0	60.0	11.5	44.5	41.0
U.S.N.M., 108002 ¹	do.....	do.....	Feb. 27, 1886	do.....	161.0	61.0	56.5	11.0	42.5	39.0
U.S.N.M., 189658 ¹	do.....	do.....	July 12, 1903	J. H. Riley...	158.0	61.0	58.5	11.5	43.0	38.5
U.S.N.M., 108813 ¹	do.....	Rum Cay ² ..	Mar. 1, 1886	C. H. Town- send.	163.0	62.5	64.0	10.2	51.0	41.0
U.S.N.M., 189659 ¹	do.....	New Provi- dence Is- land. ³	June 24, 1903	J. H. Riley...	163.0	60.0	57.0	11.5	44.0	39.0
A. E. and O. Bangs, 3423 ¹	do.....	South side of New Provi- dence Is- land. ³	May 7, 1897	C. J. Maynard	165.0	62.0	57.0	12.8	43.5	39.5
A. E. and O. Bangs, 14904 ¹	do.....	Mangrove Cay, near Andros Is- land. ³	Summer, 1904	.....	156.0	58.3	54.0	10.5	43.5	40.0
Am. Mus. N.H., 99428 ¹	do.....	Southern An- dros Island. ³	June 2, 1904	F. M. Chap- man.	162.5	61.0	51.0	10.5	46.0	38.0
M.C.Z., 56803 ¹	do.....	Alfred Sound, Great Ina- gua Island. ³	Feb. 5, 1906	W. W. Worth- ington.	164.0	58.5	57.5	12.0	47.0	40.5
Am. Mus. N.H., 99429 ¹	do.....	Southern An- dros Island. ³	June 14, 1904	F. M. Chap- man.	149.0	54.5	51.5	11.0	38.0	36.5
U.S.N.M., 108820 ¹	Female	Watling Is- land. ³	Mar. 1, 1886	.....	160.0	63.0	61.0	11.3	48.0	40.5
U.S.N.M., 108814 ¹	do.....	Rum Cay ² ..	Mar. 2, 1886	L. F. Wash- burne.	160.5	60.0	53.5	11.0	46.0	39.5
U.S.N.M., 189660 ¹	do.....	do.....	July 10, 1903	J. H. Riley...	156.0	58.0	55.0	12.0	47.0	39.0
Am. Mus. N.H., 99430 ¹	do.....	Northern An- dros Island. ³	May 16, 1904	F. M. Chap- man.	164.0	58.5	57.3	12.2	47.5	41.0
U.S.N.M., 108645.....	.....	A bacó Is- land. ³	Apr. 3, 1886	C. H. Town- send.	159.0	59.0	54.0	10.0	45.0	40.0

¹ Used in measurement averages on p. 556.

² Type.

³ Bahama Islands.

⁴ Almost adult, but apparently not full grown.

BUTORIDES VIRESCENS CUBANUS, new subspecies.

Chars. subsp.—Similar to *Butorides virescens virescens*, but smaller in all measurements; neck and sides of head usually lighter, more rufescent, less purplish; posterior lower surface averaging somewhat paler.

Description.—Type, adult male, No. 177847, U.S.N.M.; Palmarito, Cuba, February 16, 1902; William Palmer. Pileum, occipital crest, postocular region, and a short subauricular streak, deep, glossy bottle green; malar stripe light tawny ochraceous; submalar stripe purplish chestnut mixed with blackish; cheeks, auriculars, sides and back of neck, purplish chestnut, a little more rufescent anteriorly, somewhat glaucous posteriorly; upper surface of body deep bottle green, more or less glossy, the long, pointed, plume-like feathers of back and scapulars glaucous and inclining to bluish; wings fuscous, the primaries and outer secondaries dull, dark, greenish-blue slate color, a few of the inner primaries and outermost secondaries very narrowly tipped with white; tertials, outer webs of inner secondaries, and all the superior wing-coverts, dark, glossy bottle green; the outer

Guadeloupe appear to be the same as those from Cuba, although birds from Porto Rico and Saba average slightly smaller than those from Cuba; but this may be accidental or due to the smallness of the series. What this difference is will appear by inspection of the following average measurements of birds from the various islands:

Localities.	Wing.	Tail.	Ex- posed culmen.	Height of bill at base.	Tarsus.	Middle toe.
	mm.	mm.	mm.	mm.	mm.	mm.
Eight males, from Cuba and the Isle of Pines.....	164.9	61.2	58.9	11.5	48.2	43.3
Five males, from Porto Rico	165.6	59.6	56.7	11.5	47.1	42.3
One male, from Jamaica	167.0	59.0	60.5	12.5	49.8	42.5
One male, from St. John Island	173.0	66.0	58.5	12.0	51.0	48.0
Two males, from Antigua Island	167.3	60.5	57.8	12.4	47.5	42.8
One male, from Saba Island	158.0	58.0	60.5	11.5	52.0	43.5
Ten females, from Cuba and the Isle of Pines	167.8	62.2	58.8	11.3	47.3	42.2
Five females, from Porto Rico	161.3	59.1	55.8	11.5	48.0	41.5
One female, from Jamaica	167.0	58.5	58.0	11.0	46.5	42.0
One female, from St. John Island	172.0	63.5	.....	12.0	49.5	43.0
Two females, from Barbuda Island	169.0	56.8	58.8	11.9	47.9	42.0

In addition to the above, the green heron has records from the West Indian islands of Tortola, Anegada, St. Thomas, Désirade, St. Croix, Virgin Gorda, St. Bartholomew, Montserrat, and Santo Domingo, on all of which, presumably, the present race occurs, though actual examination of specimens must finally determine. Throughout its range this subspecies appears to be resident during all the year.

Of the present form we have seen 59 examples, from the following localities in the West Indies, those with asterisks representing breeding records:

Antigua Island.—

Barbuda Island.—

Cuba.—Holguin,* El Guama; United States Naval Station, Guantanamo Bay; Remedios; Guama; Pinar del Rio; Palmarito; Cabañas;* Trinidad.

Guadeloupe Island.—

Isle of Pines.—Santa Fe; Bibeyhagua,* Nueva Gerona.*

Jamaica.—Spanishtown; Westmoreland; Priestman's River.

Porto Rico.—Hucares; San Juan; Mayaguez; Arecibo; Caguas; Rio Piedras; Mameyes.

Saba Island.—

St. John Island.—

Vieques Island.—

BUTORIDES VIRESCENS CHRISTOPHORENSIS, new subspecies.

Chars. subsp.—In general appearance like *Butorides virescens bahamensis*, but bigger; and the neck and sides of head more brightly fulvescent.

Description.—Type, adult male, No. 80921, U.S.N.M.; St. Christopher Island, West Indies; F. A. Ober; original number, 221. Pileum, occipital crest, postocular region, and a short subauricular streak, deep, glossy, more or less bluish, bottle green; malar stripe buffy white; submalar stripe, cheeks, auriculars, sides and back of neck, cinnamon rufous, slightly purplish on hind neck; upper surface of body deep, somewhat bluish, bottle green, the long plume-like feathers of back and scapulars glaucous and more bluish; wings fuscous, the primaries and outer secondaries dull, dark, greenish-blue slate color, the innermost primaries and outermost secondaries narrowly tipped with white; tertials, outer webs of inner secondaries, with all the superior wing-coverts, dark, glossy bottle green; the outer scapulars on exterior webs, and the first rows of lesser wing-coverts margined all around rather narrowly with tawny or tawny ochraceous, the other rows and the median coverts with buff, the greater coverts and outer webs of tertials and innermost secondaries with white; tail mostly dark, glossy bottle green; chin and middle of upper throat white, the latter streaked medially with dull chestnut; jugulum cinnamon rufous, streaked medially with paler and with cream white; breast, abdomen, sides, flanks, crissum, and axillars, rather light smoke gray, the longest feathers of lower tail-coverts with brownish slate centers; thighs smoke gray, washed with ochraceous; lining of wing smoke gray, slightly washed with ochraceous, the edge of wing broadly cream white.

Measurements.—Male:¹ Wing, 171–175 (average, 173) mm.; tail, 60–66.5 (63.3); exposed culmen, 62.5–63 (62.8); height of bill at base, 11.5–12 (11.8); tarsus, 51–54 (52.5); middle toe, 42.5–47 (44.8).

¹ Two specimens, from St. Christopher Island, West Indies.

46-52 (49.0); middle toe, 39.5-40.5 (40.0).

Type-locality.—St. Christopher Island, West Indies.

Geographical distribution.—St. Christopher Island, West Indies.

This St. Christopher Island race may be readily distinguished from *Butorides virescens cubanus* by the greater size of the male; paler posterior lower parts; lighter, much more fulvescent (less purplish) neck and sides of head. It is very different from *Butorides virescens cubanus*, notwithstanding that its range is nearly surrounded by that of the latter. It is, in fact, much more nearly like the bird from the Bahama Islands—*Butorides virescens bahamensis*. So far as known, it is confined to the island of St. Christopher, where it is found apparently throughout the year.

Judging from the birds examined, the female is decidedly smaller than the male.

Four specimens of this race have been available, all from St. Christopher Island.

Measurements of specimens of Butorides virescens christophorensis.

Museum and number.	Sex.	Date.	Wing.	Tail.	Ex- posed culmen.	Height of bill at base.	Tarsus.	Middle toe.
			mm.	mm.	mm.	mm.	mm.	mm.
U.S.N.M., 80921 ¹	Male ²		175.0	66.5	63.0	12.0	51.0	42.5
M.C.Z., 28404 ³	[Male] ⁴		171.0	60.0	62.5	11.5	54.0	47.0
U.S.N.M., 80922 ⁵	Female ⁶		167.0	58.5	57.0	11.0	52.0	46.5
Field Mus. N. H., 33671 ⁷	do. ⁸	Mar. 8, 1890	164.0	60.0	61.0	11.5	46.0	38.5

BUTORIDES VIRESCENS DOMINICANUS, new subspecies.

Chars. subsp..—Similar to *Butorides virescens cubanus*, but wing and tail longer; posterior under surface paler; neck and sides of head averaging somewhat paler and rather less rufescent (more purplish).

Description.—Type, adult male, No. 13629, collection of E. A. and O. Bangs; Roseau, Dominica Island, West Indies, June 30, 1905; A. H. Verrill. Pileum, occipital crest, postocular region, and a short subauricular streak, deep, glossy, somewhat bluish bottle green; malar stripe cream white; submalar stripe light purplish chestnut, mixed with brownish black; cheeks, auriculars, sides and back of neck, rather light and rather purplish chestnut, more purplish and slightly glaucous posteriorly; upper surface of body dark, bluish bottle green, somewhat glossy, the long, pointed, plume-like feathers of back and scapulars glaucous; wings fuscous, the primaries and outer secondaries dull, dark, greenish-blue slate color, the innermost

¹ Two specimens, from the same island.

² Used in measurement averages on pp. 561-562.

³ Type, from St. Christopher Island, West Indies, collected by F. A. Ober.

⁴ From the same locality, collected by W. J. Branch.

⁵ From the same locality, collected by F. A. Ober.

⁶ From the same locality, collected by C. S. Winch.

lesser wing-coverts, dark, glossy bottle green; the outer scapulars on exterior webs and the first rows of lesser wing-coverts margined all around rather narrowly with tawny or tawny ochraceous, the other rows and the median coverts with buff, the greater coverts and outer webs of tertials and innermost secondaries with white; tail dull, dark, grayish blue-green; chin and middle of upper throat creamy white, the latter streaked medially with dull, dark brown; jugulum light purplish chestnut, medially vinaceous cinnamon, conspicuously streaked with white and obscurely with dull brown; breast, axillars and posterior lower parts light drab gray, somewhat darker on the breast, the longest lower tail-coverts with dark gray centers and whitish edges; thighs dull tawny; lining of wing light gray, with edgings of buff, the edge of wing broadly buffy white.

Measurements.—Male:¹ Wing, 168.5–175.5 (average, 171.3) mm.; tail, 62–69 (65.7); exposed culmen, 57–58.5 (57.8); height of bill at base, 11–12.5 (11.6); tarsus, 47.5–52 (49.5); middle toe, 42.5–46 (43.8).

Female:² Wing, 169 mm.; tail, 65; exposed culmen, 56.5; height of bill at base, 12.5; tarsus, 48.5; middle toe, 43.

Type-locality.—Roseau, Dominica Island, West Indies.

Geographical distribution.—Island of Dominica, West Indies.

This new subspecies is very much like *Butorides virescens mesatus*, from Nicaragua, but the wing and tail are somewhat longer; the bill shorter; the posterior lower parts average darker, less whitish; the neck and sides of the head a little darker, more purplish. From *Butorides virescens christophorensis* it is separable by its much less rufescent, rather darker neck and sides of head, and shorter bill; it is larger than *Butorides virescens bahamensis*, and has the neck and sides of head less fulvescent, more inclining to purplish. The juvenal plumage of *Butorides virescens dominicanus* averages darker, more heavily streaked below than that of *Butorides virescens cubanus*, at least as shown by the specimens now at hand.

The single adult female (No. 77856, U.S.N.M.) is the darkest of the adults, particularly on the posterior lower parts, and probably represents about the maximum of variation in this direction. It is not as dark as average specimens of *Butorides virescens lucianus*, from St. Lucia.³ One of the adult males (No. 14621, collection of J. Dwight, jr.), is very light below, almost whitish.

This race is apparently peculiar to the island of Dominica, where it is resident throughout the year.

Seven specimens have been at hand, those with other indication than merely "Dominica" being from the subjoined localities:

Dominica Island.—Roseau; Soufriere.

¹ Three specimens, from the island of Dominica, West Indies.

² One specimen, from the same island.

³ See p. 555.

Museum and number.	Sex.	Date.	Wing.	Tail.	Ex- posed culmen.	Height of bill at base.	Tarsus.	Middle toe.
E. A. and O. Bangs, 13029. ¹	Male ² ...	June 30, 1906	mm. 170.0	mm. 69.0	mm. 58.0	mm. 11.0	mm. 49.0	mm. 43.0
J. Dwight, 14621. ¹	.....do. ³ ...	July 14, 1901	168.5	62.0	58.5	11.3	47.5	42.5
U.S.N.M., 85204. ¹	.....do. ⁴ ...	May 4, 1880	175.5	66.0	57.0	12.5	52.0	46.0
U.S.N.M., 77856. ¹	Female ⁵.....	.....	169.0	65.0	56.5	12.5	48.5	43.0

BUTORIDES VIRESCENS MACULATUS (Boddaert).

Cancroma maculata BODDAERT, Tabl. Planch. Enlum., 1783, p. 54 (based on "Crabier tacheté de la Martinique," DAUBENTON, Planch. Enlum. No. 912; "Crabier verd tacheté," BUFFON, Hist. Nat. des Oiseaux [ed. Deux Ponts], vol. 14, p. 143; orig. ed., vol. 7, 1780, p. 405) (Martinique).

Chars. subsp.—Near *Butorides virescens dominicanus*, but wing and tail longer; and posterior lower parts darker.

Measurements.—Probable male:⁶ Wing, 179–181 (average, 180) mm.; tail, 64.2–70 (67.1); exposed culmen, 56.5–61 (58.8); height of bill at base, 12.5–13 (12.8); tarsus, 49.2–52.8 (51.0); middle toe, 43.5–46.8 (45.2).

Type-locality.—Martinique Island, West Indies.

Geographical distribution.—Island of Martinique, West Indies.

The Martinique green heron differs from *Butorides virescens cubanus* in much larger size (except length of bill), and paler, more purplish neck and sides of head. It is similar to *Butorides virescens christophorensis*, but has the wing and tail longer, bill stouter, neck much more purplish (less fulvescent), and the posterior lower parts darker. From *Butorides virescens bahamensis* it is still more different by reason of its much greater size (except length of culmen); actually as well as relatively stouter bill; darker, more purplish, less fulvescent neck and sides of head; and darker posterior lower surface. It is separable from *Butorides virescens hypernotius*, of Panama, by its longer wing and tail, much paler neck, and apparently also by somewhat lighter posterior lower parts.

One nearly adult bird (No. 33710, Field Mus.) is marked "male," but it evidently is incorrectly sexed or is not full grown, for it is altogether too much smaller than the other adults at hand, which we assume to be males.

The *Cancroma maculata* of Boddaert⁷ is the "Crabier tacheté de la Martinique" of Daubenton,⁸ and also the "Crabier verd tacheté"

¹ Used in measurement averages on p. 563.

² Type, collected by A. H. Verrill, at Roseau, Dominica Island, West Indies.

³ Collected by H. S. Branch, on Dominica Island.

⁴ Collected by H. A. A. Nichols, on Dominica Island.

⁵ Collected by F. A. Ober, on Dominica Island.

⁶ Two specimens, from Martinique Island, West Indies.

⁷ Tabl. Planch. Enlum., 1783, p. 54.

⁸ Planch. Enlum., No. 912.

maculatus (Boddaert). The subspecies seems to be confined to this island.

Three specimens examined.

Measurements of specimens of Butorides virescens maculatus.

Museum and number.	Sex.	Date.	Wing.	Tail.	Ex- posed culmen.	Height of bill at base.	Tarsus.	Middle toe.
M. C. Z., 28693 ¹	[Male] ²		mm. 181.0	mm. 70.0	mm. 61.0	mm. 12.5	mm. 49.2	mm. 43.5
M. C. Z., 28694 ³	do. ⁴		179.0	64.2	56.5	13.0	52.8	46.8
Field Mus. N. H., 33710.....	do. ⁴	Nov. 12, 1886	163.5	59.0	59.5	12.0	47.5	39.5

BUTORIDES VIRESCENS LUCIANUS, new subspecies.

Chars. subsp.—Much like *Butorides virescens maculatus*, and in color scarcely distinguishable, but smaller throughout, especially in length of the wing and tail.

Description.—Type, adult male, No. 115883, U.S.N.M.; Port Castries, St. Lucia Island, West Indies, December 1, 1888; H. E. Parmenter. Pileum, occipital crest, postocular region, and a short subauricular streak, deep, glossy bottle green; malar stripe cream white; submalar stripe light purplish chestnut mixed with blackish; cheeks, auriculars, sides and back of neck rather light purplish chestnut, somewhat more rufescent anteriorly, slightly glaucous posteriorly; upper surface of body deep bottle green, somewhat glossy, the long, pointed, plume-like feathers of back and scapulars partly more oily green, partly more bluish and a little glaucous; wings fuscous, the primaries and outer secondaries dull, dark, greenish-blue slate color, the innermost primaries and outermost secondaries narrowly tipped with white; tertials, outer webs of inner secondaries, and all the superior wing-coverts, dark, glossy bottle green; the outer scapulars on exterior webs and the first rows of lesser wing-coverts margined all around with deep tawny, the other rows and the median coverts with tawny ochraceous, the greater coverts and outer webs of tertials and innermost secondaries with ochraceous buff; tail mostly deep, glossy bottle green; chin and middle of upper throat cream white, the latter streaked medially with Prout's brown; jugulum rather light purplish chestnut, streaked medially with cream white; breast, abdomen, sides, crissum, and axillars slate gray, with a slight brownish tinge, and, on abdomen and crissum, somewhat paler, the longest feathers of lower tail-coverts with darker centers and paler margins; thighs dull tawny ochraceous; lining of wing deep gray, some of the

¹ Hist. Nat. des Oiseaux [ed. Deux Ponts], vol. 14, p. 143; orig. ed., vol. 7, 1780, p. 405.

² Used in measurement averages on page 564.

³ From Martinique Island, collector unknown.

⁴ Nearly adult, but apparently not full grown. From Martinique Island, collected by W. E. Richardson.

and tail shorter; neck and sides of head more fulvescent and averaging paler; posterior lower parts much lighter.

Description.—Type, adult male, No. 12629, collection of E. A. and O. Bangs; Joe's River, Barbados Island, West Indies, September 11, 1903; Austin H. Clark. Pileum, occipital crest, postocular region, and a short subauricular streak, deep, glossy bottle green; malar stripe buffy white; submalar stripe tawny chestnut, mixed with some blackish; cheeks, auriculars, sides and back of neck, tawny chestnut, slightly purplish posteriorly; upper surface of body deep bottle green, somewhat glossy, the long, pointed, plume-like feathers of back and scapulars somewhat oily green or glaucous bluish; wings fuscous, the primaries and outer secondaries dull, dark, greenish-blue slate color; the inner primaries and outer secondaries broadly tipped with white; tertials, outer webs of inner secondaries, with all the superior wing-coverts, dark, glossy bottle green; the outer scapulars on exterior webs and the first rows of lesser wing-coverts margined all around with tawny, the remaining wing-coverts and outer webs of tertials and innermost secondaries with ochraceous, ochraceous buff, or buff (some of the greater coverts with white); the primary coverts and some of the greater coverts with triangular terminal spots of white, apparently a relic of immaturity; most of tail glossy, dark bottle green, the middle feather greenish fuscous; chin and middle of upper throat white, the latter streaked with clove brown; jugulum rather purplish tawny chestnut, medially with conspicuous streaks of white and less marked ones of dull brown; breast, sides, abdomen, crissum, and axillars, smoke gray, rather darker on breast, lighter on middle of abdomen, the longest lower tail-coverts with fuscous terminal or subterminal patches; thighs ochraceous, mixed with dull slaty brownish; lining of wing pale gray, mixed with white and buff, the edge of wing very broadly cream white.

Measurements.—Male:¹ Wing, 163–166 (average, 164.9) mm.; tail, 58–63.5 (59.8); exposed culmen, 55–59.5 (57.1); height of bill at base, 11–12.8 (11.7); tarsus, 46–48.5 (47.1); middle toe, 40.5–42.5 (41.6).

Female:² Wing, 162–172 (166.7) mm.; tail, 60–61.5 (60.8); exposed culmen, 55.5–57 (56.3); height of bill at base, 12–13 (12.5); tarsus, 46.5–50.5 (48.3); middle toe, 41–45 (42.7).

Type-locality.—Joe's River, island of Barbados, West Indies.

Geographical distribution.—Barbados Island, West Indies.

This new subspecies resembles most closely in color *Butorides virescens bahamensis*, notwithstanding the wide geographic separa-

¹ Four specimens, from Barbados Island, West Indies.

² Three specimens, from the same island.

larger average size (excepting length of culmen); and relatively stouter bill. It differs from *Butorides virescens christophorensis*, to which also it bears close resemblance, in smaller size of the male (excepting depth of bill), and the less brightly fulvescent (more purplish) neck and sides of the head. From *Butorides virescens dominicanus* its smaller size (except of culmen), and its more fulvescent (less purplish) neck and sides of head are sufficiently diagnostic marks. Compared with *Butorides virescens maculatus*, it is much smaller throughout; the neck and sides of head are more fulvescent, less purplish, and the posterior lower parts lighter. From *Butorides virescens cubanus* the much paler posterior under surface, and the much lighter, more fulvescent neck and sides of head distinguish it at a glance. The juvenal plumage of *Butorides virescens barbadensis* apparently averages darker, more rufescent below anteriorly than the young of *Butorides virescens bahamensis*.

The female of this race appears to be somewhat larger than the male, at least on the average. Individual variation in depth of colors is considerable, as in *Butorides virescens bahamensis*. The subspecies seems to be confined to the island of Barbados, where it is found throughout the year.

Of *Butorides virescens barbadensis* there have been 10 examples seen, from the following localities, breeding records marked with an asterisk:

Barbados Island.—Joe's River; Beachmont; Bathsheba;* St. Andrews.

Measurements of specimens of Butorides virescens barbadensis.

Museum and number.	Sex.	Locality.	Date.	Collector.	Wing.	Tail.	Exposed culmen.	Height of bill at base.	Tarsus.	Middle toe.
E. A. and O. Bangs, 12629. ¹	Male....	Joe's River, Barbados I. ²	Sept. 11, 1903	A. H. Clark..	mm 163.0	mm 59.0	mm 55.0	mm 12.0	mm 46.0	mm 40.5
E. A. and O. Bangs, 12628. ¹	Male, juvenal.	Beachmont, Barbados I.	Sept. 9, 1903	...do.....	165.5	58.0	57.0	11.0	47.0	42.5
E. A. and O. Bangs, 12633. ¹	...do....	Bathsheba, Barbados I.	Aug. 6, 1903	...do.....	160.0	58.5	57.0	12.8	48.5	41.0
Field Mus. N. H., 33651. ¹	Male....	Barbados Island.	Feb. 3, 1896	W. E. Richardson.	165.0	63.5	59.5	11.0	47.0	42.5
E. A. and O. Bangs, 12626. ¹	Female.	Joe's River, Barbados I.	Sept. 10, 1903	A. H. Clark..	166.0	61.5	57.0	12.5	47.8	42.0
E. A. and O. Bangs, 12627. ¹	...do. ³....	...do.....	Aug. 29, 1903	...do.....	162.0	....	55.5	13.0	46.5	41.0
E. A. and O. Bangs, 12630. ¹	Female, juvenal.	St. Andrews, Barbados I.	Sept. 7, 1903	...do.....	172.0	60.0	56.5	12.0	50.5	48.0

¹ Used in measurement averages on p. 567.

² Type.

³ Not quite adult.

BUTORIDES VIRESCENS GRENADENSIS, new subspecies.

Chars. subsp.—Similar to *Butorides virescens lucianus*, but neck and sides of head darker, rather more rufescent (less purplish).

Description.—Type, adult male, No. 74147, U.S.N.M.; Grenada Island, West Indies, March —, 1878; F. A. Ober; original number 505. Pileum, occipital crest, postocular region, and a short subauricular streak, deep, glossy bottle green; malar stripe cream buff; submalar stripe mixed blackish and chestnut; cheeks, auriculars, sides and back of neck, purplish chestnut, a little more rufescent anteriorly, slightly glaucous posteriorly; upper surface of body deep bottle green, more or less glossy, the long, pointed, plume-like feathers of back and scapulars in part somewhat glaucous; wings fuscous, the primaries and outer secondaries dull, dark, greenish-blue slate color, the inner primaries and outer secondaries tipped with white; tertials, outer webs of inner secondaries, and all the superior coverts deep bottle green, but in most places worn until grayish or bluish; the outer webs of outer scapulars and the first rows of lesser wing-coverts margined all around with tawny ochraceous, the remaining rows and the median coverts with buff, the greater series and outer webs of tertials and innermost secondaries with cream white; tail mostly dark bottle green, somewhat glossy; chin and middle of upper throat creamy white, medially streaked with clove brown; jugulum purplish chestnut, streaked medially much with white and a little with dark, earthy brown; breast, abdomen, sides, crissum, and axillars, slate gray with a brownish tinge, the longest feathers of under tail-coverts whitish, with large, dark brownish gray distal patches; thighs dull ochraceous mixed with dark brownish gray; lining of wing slate gray, rather brownish, mottled with cream buff and ochraceous, the edge of wing broadly cream buff.

Measurements.—Male:¹ Wing, 169–170.5 (average, 169.8) mm.; tail, 59–66 (61.6); exposed culmen, 56–63 (59.9); height of bill at base, 12–12.5 (12.3); tarsus, 48.5–51.5 (50.3); middle toe, 43.8–46 (44.7).

Female:² Wing, 159 mm.; tail, 58.5; exposed culmen, 58.5; height of bill at base, 11.5; tarsus, 49; middle toe, 40.

Type-locality.—Grenada Island, West Indies.

Geographical distribution.—Southern Lesser Antilles, West Indies: south to Grenada Island; north to Carriacou, Bequia, and St. Vincent Islands.

The present form is apparently almost identical in color with *Butorides virescens cubanus*, although the posterior lower parts average slightly darker; but in size the male, at least, averages larger. It is thus very close to the Cuban form, but in view of the wide separation of range and the direct interposition of three other races, it seems best to consider the Grenada bird as a different form, since it is doubtless an offshoot of one of the neighboring races, rather than of the far-distant *Butorides virescens cubanus*, its resemblance to that subspecies being fortuitous or due to climatic or environmental conditions.

¹ Four specimens, from the islands of Grenada and Bequia, West Indies.

² One specimen, from St. Vincent Island, West Indies.

neck and sides of head. Compared with *Butorides virescens dominicanus*, it has decidedly darker posterior lower parts, usually darker and rather more rufescent (less purplish) neck and sides of head, and in the male, at least, somewhat shorter tail. It is slightly smaller, in the male, than *Butorides virescens christophorensis*, but has a stouter bill; the neck and sides of head are much darker, very much less fulvescent (much more purplish); and the hind parts below are darker. It may easily be separated from *Butorides virescens barbadensis* by larger size throughout, at least in the male; darker, less fulvescent neck and sides of head, and darker gray posterior lower parts. It may be distinguished readily from *Butorides virescens bahamensis* by its larger size throughout (at least in the male), much darker, less fulvescent (more purplish) neck and sides of head, and darker posterior under surface. The juvenal plumage is apparently indistinguishable from that of *Butorides virescens cubanus*.

Specimens from the islands of Bequia and Carriacou are seemingly identical with the Grenada bird, in both size and color. A single female from St. Vincent, while of the same coloration, is very much smaller than the males from Grenada and Bequia, but apparently belongs with them. This subspecies thus ranges over the islands from Grenada north to St. Vincent, and is resident here throughout the year. In addition to the above localities of specimens, there is record of its occurrence on Mustique Island, and it probably lives in all suitable places throughout the Grenadines.

Seven specimens have been examined, from the following West Indian localities, the breeding records being noted by an asterisk:

Bequia Island.—Spring Estate.

Carriacou Island.—Harvey Vale.

Grenada Island.—St. George.*

St. Vincent Island.—Rutland Vale.

Measurements of specimens of Butorides virescens grenadensis.

Museum and number.	Sex.	Date.	Wing.	Tail.	Ex-posed culmen.	Height of bill at base.	Tarsus.	Middle toe.
E. A. and O. Bangs, 13212 ¹ ..	Male ² ...	May 24, 1904	mm. 170.5	mm. 61.5	mm. 56.0	mm. 12.5	mm. 48.5	mm. 43.8
U.S.N.M., 74147 ¹	do. ³ ...	Mar. —, 1878	169.0	59.0	60.0	12.0	51.0	46.0
E. A. and O. Bangs, 12896 ¹ ..	do. ⁴ ...	Nov. 30, 1903	170.0	66.0	12.0	63.0	50.0	44.0
E. A. and O. Bangs, 12897 ¹ ..	[Male] ⁴ ...	Dec. 2, 1902	169.5	60.0	60.5	12.5	51.5	45.0
U.S.N.M., 74034 ¹	Female ⁵ ..	Jan. 26, 1878	159.0	58.5	58.5	11.5	49.0	40.0

¹ Used in measurement averages on p. 569.

² Collected by A. H. Clark, at St. George, Grenada Island.

³ Type, collected by F. A. Ober, on Grenada Island.

⁴ Collected by A. H. Clark, at Spring Estate, Bequia Island.

⁵ Collected by F. A. Ober, at Rutland Vale, St. Vincent Island.

BUTORIDES VIRESCENS TOBAGENSIS, new subspecies.

Chars. subsp..—Resembling *Butorides virescens grenadensis*, but wing and tail slightly longer; bill more slender; neck, and sides of head, particularly cheeks and jugulum, lighter, more fulvescent, the hind neck somewhat duller.

Description..—Type, adult [probably male], No. 18033, Museum of Comparative Zoology; Tobago Island; R. W. Rawson. Pileum, occipital crest, postocular region, and a short subauricular streak, deep, glossy bottle green; malar stripe buffy white; submalar stripe tawny chestnut mixed with blackish; cheeks, auriculars, sides and back of neck, tawny chestnut, somewhat purplish and duller posteriorly; upper surface of body deep, more or less glossy, bottle green, the long, pointed, plume-like feathers of back and scapulars somewhat glaucous and inclining to bluish; wings fuscous, the primaries and outer secondaries dull, dark, greenish-blueslate color, the innermost primaries and outermost secondaries narrowly tipped with white; tertials, outer webs of inner secondaries, with all the superior wing-coverts, dark, glossy bottle green; outer scapulars on exterior webs and the first rows of lesser wing-coverts margined all around rather narrowly with tawny ochraceous, the other rows and the median coverts with buff, the greater coverts and outer webs of tertials and innermost secondaries with white; tail dark, glossy bottle green; chin and middle of upper throat creamy white, the latter streaked medially with clove brown; jugulum rather purplish tawny chestnut, much streaked medially with white, slightly with pale clove brown; breast, abdomen, sides, crissum, and axillars slate gray with a slight brownish tinge, the longest feathers of lower tail-coverts with slate-colored terminal portions; thighs dull tawny mixed with grayish brown; lining of wing slate gray, the feathers margined with buff or ochraceous, the edge of wing broadly buffy white.

Measurements..—Male:¹ Wing, 167.5–178 (average, 172.5) mm.; tail, 63–66.8 (64.7); exposed culmen, 55–63 (58.3); height of bill at base, 11–12 (11.4); tarsus, 46.5–51 (48.4); middle toe, 43.5–45 (44.4).

Type-locality..—Tobago Island, West Indies.

Geographical distribution..—Tobago Island, West Indies.

This new subspecies is much like *Butorides virescens maculatus*, but is smaller, except the length of the bill; and the neck and sides of head, particularly the cheeks and jugulum, are more fulvescent. From *Butorides virescens lucianus* it differs in having the neck and sides of the head duller, darker, less glaucous purplish, and, especially on cheeks and jugulum, more fulvescent. It is distinguishable from *Butorides virescens hypernotius* by its lighter, duller, more rufes-

¹ Four specimens, from the island of Tobago, West Indies.

and usually somewhat lighter posterior lower surface. Compared with *Butorides virescens dominicanus* it has the neck and sides of head darker, duller, and more rufescent; the jugulum much more fulvescent and conspicuously contrasted with surrounding parts; also the lower posterior parts darker. It may be separated from *Butorides virescens cubanus* by its longer wing and tail; lighter, duller, more rufescent (less purplish) neck and sides of head; conspicuously lighter, more fulvescent, and more contrasted jugulum. It is very easily distinguished from *Butorides virescens christophorensis*, by reason of its darker, duller, much less fulvescent (more purplish) neck and sides of head; much more contrasted jugulum; and much darker posterior lower parts. It is much unlike *Butorides virescens barbadensis* inasmuch as it is larger, though with a relatively more slender bill; and has the neck and sides of head duller, less fulvescent and somewhat more purplish, particularly posteriorly; the jugulum much more fulvescent and thus strongly contrasted with the surrounding parts; and the posterior under parts darker. It is even more different from *Butorides virescens bahamensis* in its much greater size throughout, darker, duller, less fulvescent (more purplish) neck and sides of head, and darker posterior lower surface.

A single bird in juvenal plumage does not differ from the same stage of *Butorides virescens cubanus*.

This island race is rather peculiar in its combination of color characters; for the fulvescent cheeks and jugulum are in more decided contrast to the adjacent parts than is the case in most of the other forms of the species; and the hind neck is unusually dull colored. The jugulum is still more fulvescent in two Field Museum specimens (Nos. 33659 and 33662) than in the type.

So far as known it is peculiar to the island of Tobago and permanently resident there.

Five specimens have been examined, all from the island of Tobago.

Measurements of specimens of Butorides virescens tobagensis.

Museum and number.	Sex.	Date.	Wing.	Tail.	Ex- posed cul- men.	Height of bill at base.	Tarsus.	Middle toe.
			mm.	mm.	mm.	mm.	mm.	mm.
Field Mus. N. H., 33659 ¹	Male ²	Apr. 20, 1892	174.0	64.0	63.0	12.0	51.0	45.0
Field Mus. N. H., 33662 ¹	do. ²....	.....do.....	170.5	65.0	58.8	11.0	47.0	45.0
Field Mus. N. H., 33662 ¹	do. ²	Apr. 15, 1892	167.5	63.0	55.0	11.7	46.5	44.0
M.C.Z., 18033 ¹	[Male] ³		178.0	66.8	56.5	11.0	49.0	45.5

¹ Used in measurement averages on p. 571.

² Collected by W. W. Brown, on Tobago Island.

³ Type, collected by R. W. Rawson, on Tobago Island.

Chars. subsp..—Similar to *Butorides virescens tobagensis*, but decidedly smaller (except bill and tarsus); neck and sides of head darker, less rufescent (more purplish) and not quite so dull; jugulum much darker, less fulvescent (more purplish), and not different in color from the adjoining portion of neck; glaucous, long, pointed, plumaceous feathers of upper surface with numerous very evident, though obsolescent, narrow, darker bars; breast and upper abdomen narrowly and somewhat obscurely, though evidently, barred with darker brownish gray.

Description..—Type, adult male, No. 37409, Carnegie Museum; St. Patrick, Curaçao Island, West Indies, May 2, 1911; M. A. Carriker, jr. Pileum, occipital crest, and postocular region, deep, glossy bottle green; a short subauricular streak black; malar stripe buff; submalar stripe somewhat purplish chestnut mixed with blackish; cheeks, auriculars, sides and back of neck, purplish chestnut, decidedly more fulvescent anteriorly, slightly glaucous posteriorly; upper surface of body deep bottle green, somewhat glossy, the long, pointed, plume-like feathers of back and scapulars in part rather oily or bronzy green, in part glaucous and somewhat bluish, and with very narrow, darker, somewhat obscure though very evident, cross-bars, these giving to all these feathers a peculiar "watered" appearance; wings fuscous, the primaries and outer secondaries dull, dark, greenish-blue slate color, most of the primaries and the outermost secondaries tipped with white; tertials, median and lesser wing-coverts, dark, glossy bottle green; outer scapulars margined on outer webs with dark, dull chestnut; most of the lesser wing-coverts margined all around with tawny, some of them with spots of buffy or whitish; median coverts broadly margined with tawny ochraceous; greater coverts narrowly edged with whitish or buffy, some of them having also small terminal whitish shaft spots; primary coverts with large sub-triangular terminal shaft spots of white or cream buff; tail dull, brownish bottle green, with a few obsolescent, narrow, grayish bars, and a narrow light brownish tip; chin and middle of upper throat buffy white, streaked medially with dark blackish brown, sparingly on the former, more heavily on the latter; jugulum purplish chestnut, streaked medially with white and a little with dark brown; breast, abdomen, sides, crissum, and axillars, slate gray with a brownish tinge, the middle of abdomen rather paler, the longest lower tail-coverts with whitish centers, the breast and upper abdomen with numerous narrow, obsolescent, darker bars; thighs rufescent; lining of wing rather light gray, mixed with cream white, cream buff, and a little ochraceous, the edge of wing broadly cream white.

Type-locality.—St. Patrick, Curaçao Island, West Indies.

Geographical distribution.—Island of Curaçao; possibly also the neighboring islands of Aruba and Bonaire.

Although the type is the only available specimen, it appears to represent an easily distinguishable subspecies. It differs from all of the other subspecies in the narrow barring of the breast, a character not present, even slightly, in any specimen of any form of *Butorides virescens* examined; and also in the distinctly barred effect of the long, pointed, glaucous, plume-like feathers of the back and scapulars. The latter character is discernible on close examination in some specimens of all the other races, but is in them scarcely obvious enough to be worth mentioning in either diagnoses or descriptions, and in no specimen of any of these other forms is it nearly so conspicuous as in the type of *Butorides virescens curacensis*. In addition to the two characters just mentioned, the present new race differs from *Butorides virescens cubanus*, with which in general appearance it bears closest resemblance, in smaller size (except bill), and also duller, less purplish (more fulvescent) neck and sides of head. From *Butorides virescens grenadensis* it may be distinguished in the same way, and in size still more decidedly. Additional characters separating it from *Butorides virescens maculatus* are much smaller size (except length of culmen), and darker, duller, more fulvescent (less purplish) neck and sides of head; from *Butorides virescens lucianus*, smaller size (except length of culmen), and darker, less purplish neck; from *Butorides virescens dominicanus*, smaller general size, longer bill, darker, duller neck and jugulum, and more deeply colored posterior lower parts; and from *Butorides virescens hypernotius*, of the mainland of South America and Costa Rica, much smaller size (except bill), and lighter, duller, less purplish (more fulvescent), neck and sides of head.

The type of *Butorides virescens curacensis* bears still some slight indications of immature plumage in the whitish and buffy spots on the lesser, greater, and primary coverts, broad edgings of median coverts, and in the dull fuscous greater coverts and a few of the inner secondaries; but in other respects it seems to be fully adult.

This may well be the form of *Butorides virescens* occurring on the near-by islands of Aruba and Bonaire,² but we have seen no specimens from those localities.

KEY TO THE SUBSPECIES OF BUTORIDES VIRESCENS.

- a. Colors deeper; posterior lower parts slate color or darker.
- b. Size smaller (wing averaging less than 170 mm.); white on median portion of foreneck usually much reduced..... *Butorides virescens margaritophilus*.
- b¹. Size larger (wing averaging more than 170 mm.); white on median portion of foreneck much more extensive.

¹ One specimen, the type, from Curaçao Island.

² Hartert, *Ibis*, 1893, p. 307.

c¹. Neck and sides of head darker, less rufescent (more purplish).

Butorides virescens frazari.

a¹. Colors lighter; posterior lower parts slate gray or paler.

b. Posterior lower parts light gray.

c. Larger (wing averaging more than 178 mm.).

d. Neck darker; size smaller (wing averaging less than 185 mm.).

Butorides virescens eremonomus.

d¹. Neck lighter; size larger (wing averaging more than 189 mm.).

Butorides virescens anthonyi.

c¹. Smaller (wing averaging less than 175 mm.).

d. Neck and sides of head less fulvescent (more purplish) chestnut.

e. Smaller (wing of male averaging less than 168 mm.); neck and sides of head more fulvescent (less purplish). . . . *Butorides virescens barbadensis.*

e¹. Larger (wing of male averaging more than 168 mm.); neck and sides of head less fulvescent (more purplish).

f. Posterior lower parts usually paler, more whitish; neck and sides of head averaging lighter, less purplish, chestnut; wing and tail somewhat shorter; bill more slender. . . . *Butorides virescens mesatus.*

f¹. Posterior lower parts usually darker, less whitish; neck and sides of head darker, more purplish, chestnut; wing and tail somewhat longer; bill stouter. . . . *Butorides virescens dominicanus.*

d¹. Neck and sides of head more fulvescent (less purplish) chestnut.

e. Smaller (wing less than 166 mm.); neck and sides of head less brightly fulvescent. . . . *Butorides virescens bahamensis.*

e¹. Larger (wing usually more than 166 mm.); neck and sides of head more brightly fulvescent. . . . *Butorides virescens christophorensis.*

b¹. Posterior lower parts slate gray.

c. Larger (wing averaging more than 175 mm.).

d. Neck and sides of head paler; posterior lower parts averaging somewhat lighter. . . . *Butorides virescens maculatus.*

d¹. Neck and sides of head darker; posterior lower parts averaging somewhat darker. . . . *Butorides virescens virescens.*

c¹. Smaller (wing averaging less than 175 mm.).

d. Neck and sides of head darker.

e. Breast obscurely barred; long, pointed, plume-like feathers of back and scapulars distinctly barred; wing of male averaging less than 162 mm.

Butorides virescens curacensis.

e¹. Breast not barred; long, pointed, plume-like feathers of back and scapulars not distinctly barred; wing of male averaging more than 162 mm.

f. Neck and sides of head averaging darker, more purplish (less rufescent); size larger (wing averaging over 171 mm.).

Butorides virescens hypnotus.

f¹. Neck and sides of head averaging lighter, less purplish (more rufescent); size smaller (wing averaging under 171 mm.).

g. Smaller (wing of male averaging about 165 mm.); posterior lower parts averaging slightly lighter. . . . *Butorides virescens cubanus.*

g¹. Larger (wing of male averaging about 170 mm.); posterior lower parts averaging slightly darker. . . . *Butorides virescens grenadensis.*

d¹. Neck and sides of head lighter.

e. Neck and sides of head brighter, paler, and more purplish, and particularly on jugulum and cheeks, less fulvescent.

Butorides virescens lucianus.

e¹. Neck and sides of head duller, darker, and less purplish, and, particularly on jugulum and cheeks, more fulvescent.

Butorides virescens tobagensis.

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1. THAUMATICHTHYS PAGIDOSTOMUS. FROM THE TYPE.

2. THAUMATICHTHYS PAGIDOSTOMUS.

View of head from below and dorsal view of entire fish.

[SCIENTIFIC RESULTS OF THE PHILIPPINE CRUISE OF THE FISHERIES STEAMER
"ALBATROSS," 1907-1910. NO. 20.]

DESCRIPTION OF A NEW FAMILY OF PEDICULATE FISHES FROM CELEBES.

By HUGH M. SMITH and LEWIS RADCLIFFE,
Of the United States Bureau of Fisheries.

During the Philippine expedition the Fisheries steamer *Albatross* cruised around the island of Celebes and made dredgings at various places off the coast and in the bays of that island. A number of deep-water stations were established in the Gulf of Tomini on the east coast, and among the animals there obtained was the remarkable fish that is the subject of this paper.

THAUMATICHTHYIDÆ, new family (Pediculati).

Highly divergent pediculates characterized by elongate, slender body; large, depressed head, with weak, slender bones; enormous horizontal mouth, with large, unequal teeth; upper jaw much longer and broader than lower, the premaxillaries widely separated at tip, leaving a broad edentulate concavity; small eye near angle of mouth; small gill openings, below axil of pectorals; pseudobranchiæ absent; well-developed fins, the pectorals not geniculated, the ventrals absent, a greatly modified detached dorsal spine which lies in a membranous area on the top of the head and terminates in a complex lure within the mouth near the anterior margin of the jaw.

This family is most nearly related to the Ceratiidæ among the known pediculates, but is distinguished therefrom by the greatly expanded and depressed head, the slender body, the shape of the upper jaw, the dentition, the absence of free dorsal spines, the remarkable modification of the illicium, etc.

THAUMATICHTHYS Smith and Radcliffe, new genus.

Body elongate, compressed; head large, depressed, and expanded laterally, the feeble, slender bones separated and held in place by a very thin, translucent membrane; mouth large, cavernous; jaws very broad, unequal; upper jaw with a wide central semicircular indentation

rounded; long, depressible, unequal curved or hooked teeth in each jaw; a pair of long, hinged, hooked teeth on each side of upper jaw near the tip of the premaxillary, these lying against the roof of the mouth and capable of lateral motion; eye small, near angle of mouth; nostril close to eye; gill openings small, slit-like; gill arches 3, short; lower part of body and head covered with spiniferous tubercles; soft dorsal well developed, with 8 rays; a single subdermal cephalic spine (illicium) extending from frontals nearly to tip of snout, dilating into a small, bulbous organ; the latter projects and is surmounted by a tooth-bearing pedicel; caudal large; anal small; pectoral rays 15.

(*Thaumaticthys*; from *θαύμα*, a wonder, and *ἰχθύς*, a fish.)

THAUMATICHTHYS PAGIDOSTOMUS Smith and Radcliffe, new species.

Plate 72, figs. 1, 2.

Dorsal 6; caudal 8; anal 4; pectoral 15.

Head large, broad, rectangular, depressed, constricted immediately behind posterior angle of jaws, its length (measured from anterior margin of branchial aperture) 2.06 in total length of fish to base of caudal (2.8 to tip of caudal), its breadth 1.43 in its length, its depth 2.5 in its length; body slender, compressed, tapering; caudal peduncle slender, its depth 6.6 in head; eye minute, 20 in head, 11.3 in snout, situated on upper edge of angle of jaws; snout (measured to tip of projecting premaxillaries) 1.81 in head; mouth horizontal, cavernous, the slender and widely separated cranial bones, with the thin skin, forming an exceedingly elastic boundary; upper jaw much the longer, the tip of the evenly rounded lower jaw not reaching to the cavity between the premaxillaries; maxillary very slender, not dilated at tip, fitting into the side of the mandible near angle of jaw; premaxillaries 1.5 in head, the articular processes elongate, divergent; mandible 1.88 in head; teeth long, unequal, cardiform, depressible, with incurved tips, those on upper jaw the larger, arranged in groups; a wide toothless space at tip of upper jaw where the premaxillaries diverge; a pair of long, hinged, hook-like teeth, the largest 2.35 in premaxillary, inserted near inner process of premaxillary and lying closely applied to roof of mouth, these teeth capable of being swung forward laterally like cranes so as to close the toothless space in front of jaw; a small patch of small teeth on either side of roof of mouth posteriorly; gullet constricted, apparently distensible to a considerable degree; the single detached dorsal spine lying in skin on top of head and extending nearly to margin of upper jaw, where it terminates in a bulbous process about size of eye; this bulb projects through roof of mouth into the oral cavity and appears to be a luminous organ, and from it there extends downward into the mouth a slender pedicel

bearing at its tip a sharp tooth-like process that curves backward; nostrils bulbous, immediately in front of eyes; gill arches with a few very large, plume-like filaments; skin of ventral surface and sides of body with conspicuous prickles resting on a circular base, some prickles extending upward to base of anterior dorsal rays, and a few on opercle.

Dorsal and anal relatively low, the rays simple; caudal elongate, narrow, rounded, the two outer rays above and below simple, the other divided; pectorals small, 3 in head.

Color in alcohol: Above sepia, becoming grayish black on ventral surface; inside of mouth dull gray; fins dark sepia.

Type.—Cat. No. 72952, U.S.N.M., 8.4 cm. in length, taken with a beam trawl at station 5607 (lat. $0^{\circ} 04' 00''$ S.; long. $121^{\circ} 36' 00''$ E.), near Binang Unang Island, Gulf of Tomini, Celebes, at a depth of 761 fathoms, on a bottom of fine sand.

In this extraordinary fish the head is nearly as long as the remainder of the body, and the length of the mouth is more than half that of the head. It would appear that the cavernous, elastic mouth is a trap into which the food is lured and dispatched. The light from the bulb in the roof of the mouth shines through the toothless space in the front of the upper jaw and attracts the prey which, having entered the mouth, is prevented from escaping and brought within reach of the lateral teeth by the two pair of large hinged, hooked teeth.

(*pagidostomus*; from *παγίς*, a trap or snare, and *στομα*, a mouth.)

DESCRIPTION OF A NEW SPECIES OF ISOPOD BELONGING TO THE GENUS APSEUDES FROM ECUADOR.

By HARRIET RICHARDSON,

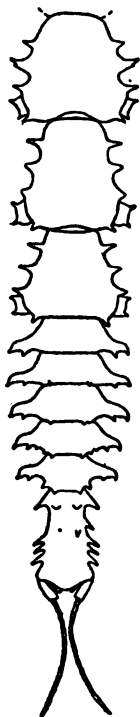
Collaborator, Division of Marine Invertebrates, United States National Museum.

A single imperfect specimen representing a new species of *Apseudes* was collected off Cape San Lorenzo, Ecuador, by the U. S. Bureau of Fisheries steamer *Albatross* in 1888. Although the anterior half of the specimen is missing, the part obtained is in such good condition and so entirely distinct from any known species that it seems worth while to describe it.

APSEUDES MERIDIONALIS, new species.

The single specimen is incomplete, consisting of only the posterior half of the body—or the last three segments of the thorax and the abdomen. It measures 16 mm. in length and 3 in width. Each of the thoracic segments is provided with four spines on either side, the two anterior being larger and longer than the two posterior. Between the two posterior spines is situated the epimeron, which is provided with two spines, one at the antero-lateral angle and the other at the post-lateral angle. The fifth and sixth thoracic segments (fourth and fifth free segments) measure each 3 mm.; the seventh segment (sixth free segment) measures 2½ mm. in length.

The five anterior segments of the abdomen are sub-equal and are each 1 mm. long; the lateral parts are produced on either side in a process which is provided with two small spines, one at the post-lateral angle and the other halfway between that and the posterior margin of the segment; the fourth and fifth segments have additional smaller spines on the posterior margin of these lateral processes. On the posterior margin of the second, third, fourth, and fifth segments are two small spines, one on either side of the median line. The sixth or terminal segment is 4 mm. long; at the place of attachment of the uropods it is 1½ mm. wide; at



APSEUDES MERIDIONALIS. POSTERIOR HALF OF BODY. X44.

the middle, with three long spines on either side of the lateral margin; on one side there is a fourth spine in front of the three lateral spines. On the dorsal surface just within the anterior lateral spines are two small spines, one on either side of the median line, and behind these at about the middle of the segment are two other small spines, one being larger and more conspicuous than the other. The posterior end of the segment is slightly triangular. The basal article of the uropoda is about twice as long as wide; the outer branch is composed of 17 articles; the inner branch is lost. On the ventral side of the sixth segment of the thorax (fifth free segment) there is a long median spine and a short one is present on each of the first five abdominal segments.

Half of one specimen was taken by the U. S. Bureau of Fisheries steamer *Albatross* March 2, 1888, at station 2792, off Cape San Lorenzo, Ecuador, in lat. $00^{\circ} 37' 00''$ S.; long. $81^{\circ} 00' 00''$ W., at a depth of 401 fathoms, in green mud.

The type is Cat. No. 43504, U.S.N.M.

This is the first species of *Apseudes* recorded from South America. It is an unusually large member of the genus. The other 28 known species are as follows:

talpa (Montagu).

latreilli (M. Edwards).

spinosus M. Sars.

cæcus Willemoes-Suhm.

australis Haswell.

obtusifrons Haswell.

latus Chilton.

timaruvius Chilton.

tenuimanus G. O. Sars.

echinatus G. O. Sars.

robustus G. O. Sars.

spectabilis Studer.

antarcticus Beddard.

uncidigitatus Norman and Stebbing.

*obtusifrons*¹ Norman and Stebbing.
simplicirostris Norman and Stebbing.

grossimanus Norman.

gracilis Norman and Stebbing.

sculptus Pfeffer.

intermedius Hansen.

hibernicus Walker.

multicarinatus Whitelegge.

spinosus Moore.

triangulatus Richardson.

propinquus Richardson.

seurati Nobili.

rikiteanus Nobili.

armatus Richardson.

The species described by Bonnier² as *Apseudes koehleri* is probably a synonym of *Apseudes spinosus*, as Norman has previously stated. Norman has also referred *A. acutifrons* Sars and *A. hastifrons* Norman and Stebbing to a new genus *Apseudopsis*.

¹ Since the specific name of this species was used by Haswell five years earlier, I therefore name this species *Apseudes retusifrons*.

² Ann. Univ. Lyon, vol. 26, 1896, p. 562.

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NOTES ON A COLLECTION OF FISHES FROM JAVA, MADE
BY OWEN BRYANT AND WILLIAM PALMER IN 1909,
WITH DESCRIPTION OF A NEW SPECIES.

By BARTON A. BEAN and ALFRED C. WEED.
Of the Division of Fishes, United States National Museum.

Mr. Owen Bryant, of Cohasset, Massachusetts, having invited the United States National Museum to send a representative with him to Java for the purpose of obtaining natural history specimens, Mr. William Palmer was detailed by the museum for the duty and the present paper records the ichthyological collections made by them. Nine hundred and seventy-nine specimens were secured, representing 106 genera and 182 species.

The principal publications referred to in the paper are: Dr. P. Bleeker's *Atlas Ichthyologique des Indes Orientales Néerlandaises*, published under the auspices of the *Gouvernement Colonial Néerlandais*, by Fred. Müller, Amsterdam, 1862-1877. Nine volumes, folio, of this *Atlas* were published, and they form the principal work of Doctor Bleeker's life, bringing together the published results of his exhaustive labors upon the fishes of the Indo-Australian Archipelago.

In making a study of the fishes of the East India Archipelago Doctor Bleeker's works are indispensable and in connection with reference thereto the volume entitled *The Fishes of the Indo-Australian Archipelago*, index of the ichthyological papers of P. Bleeker by Dr. Max Weber and Dr. L. F. de Beaufort, Leiden, 1911, is invaluable. This publication is an attractive octavo of more than 400 pages, and gives besides a short account of his life indexes of bibliography, genera, and species.

SPHYRNA ZYGÆNA (Linnaeus).

One young specimen from Batavia representing the species figured under this name by Bleeker¹ and by Day.² Total length, 480 mm.; width of head, 130 mm.; lateral expansion, shortest distance from

¹ Bijdrage tot de kennis der Plagiostomen van den Indischen Archipel. (*Verhandelingen van het Bataviaasch Genootschap van Kunsten en Wetenschappen*, deel XXIV, 1862, pp. 1-92. Batavia.) p. 42, pl. 3, fig. 8.

² Day, Francis. *The Fishes of India*, vols. 1 and 2, quarto, 196 pls. London, 1876 and 1878, p. 719, pl. 186, fig. 4.

yolk sac had been about absorbed (?), but the umbilical opening had not closed.

CARCHARIAS SORRAH¹ (Müller and Henle).

Two males and three females from Batavia. Length of males, 600 mm. and 220 mm.; length of females, 600 mm., 430 mm., and 315 mm. The smallest male and the intermediate female have the snout a little pointed and the mouth slightly different in shape. The origin of the first dorsal, also, is more nearly midway between pectorals and ventrals, and is about over the end of the pectoral fin. In the other specimens the origin of the first dorsal is over the middle of the pectoral. These two specimens may represent the true *C. sorrah* and the rest *C. javanicus*, but we find no trenchant differences. According to Bleeker's descriptions all agree more closely with *C. sorrah* than with any other species.

RYNCHOBATUS DJIDDENSIS (Peraki).

One specimen, the total length of which is 550 mm., taken at Batavia, represents the species figured under this name by Day.² The same species was described under the name *R. laevis* by Bleeker³, and by Müller and Henle.⁴

TRYGON PASTINACOIDES Bleeker.

One small specimen from Batavia, length, 190 mm.; tail, 120 mm. Bleeker⁵ under this name and assigned to the synonymy of *T. uarnak* by Day.⁶ It is a very differently appearing fish from the one figured by Day. It is possible that this species as well as *T. uarnacoides* should be placed in the synonymy of *T. uarnak*, but as we are unable to satisfy ourselves on this point, it seems better to retain the names proposed by Bleeker.

TRYGON UARNACOIDES Bleeker.

One specimen. Length, 590 mm.; tail, 450 mm. Batavia. It was originally described by Bleeker⁷ but Day⁸ placed it in the synonymy of *T. uarnak*.

MYLIOBATIS NIEUHOFFII (Bloch and Schneider).

Two specimens from Batavia. Male: Length, 840 mm.; length of disk, 250 mm.; width, 410 mm.; tail, 630 mm. Female: Length, 550 mm.; length of disk, 160 mm.; width, 260 mm. (about); tail,

¹ See Bleeker, *Plagiostomen*, p. 39, and Day, *Fish. India*, p. 714, pl. 135, fig. 1.

² *Fish. India*, p. 730, pl. 192, fig. 1.

³ *Plagiostomen*, p. 58.

⁴ *Idem*, p. 111.

⁵ *Idem*, p. 75.

⁶ *Fish. India*, p. 737, pl. 195, fig. 1.

⁷ *Plagiostomen*, p. 72.

⁸ *Fish. India*, p. 737, pl. 194, fig. 1.

400 mm. The tail in the smaller of these specimens is rather longer than described by Bleeker,¹ but this character is quite variable.

MYLIOBATIS MILVUS: Müller and Henle.

One male specimen from Batavia. Length, 1,540 mm.; length of disk, 320 mm.; width about 550 mm.; tail, 1,260 mm.

ELOPS MACHNATA (Forsk.).

Seven specimens from Batavia, 250 to 370 mm. long, seem to represent this species, although they do not exactly agree with the description given by Regan.²

We have examined 35 specimens of the genus *Elops*, as follows: Java, 7; Ashantee, West Africa, 3; west coast America, 5; Australia, 3; east coast America, 6; Philippine Islands, 5; Hawaii, 5; Hongkong, China, 1.

This series is entirely too limited to allow us to decide between the more closely allied forms described by Regan, but the indication is that our specimens will not entirely bear out his conclusions. We hope to be able at some time to get a sufficient series from one locality to give a clue to the amount of individual variation to expect.

Our specimens seem to indicate separate groups as follows: (1) East America, (2) West America, (3) West Africa, (4) Australia and part of Philippine specimens, (5) other Pacific and Indian Ocean specimens.

We have made counts of vertebræ as follows: East coast America, skeleton, 75½; Java, radiograph, 65½; Ashantee, West Africa, radiograph, 69½; west coast America, radiograph, 79½; Philippine Islands, radiograph, 65½; Hawaii, radiograph, 68½; Hongkong, China, radiograph, 65½.

The species represented by our specimens from Java was described by Bleeker under the name *Elops saurus*.⁴

MEGALOPS CYPRINOIDES (Broussonet).

Nine specimens, 220 to 285 mm. long. Batavia.

We have examined specimens from Australia, Samoa, and the Philippine Islands. There is a possibility that the Samoan specimens may be separable on slight grounds from the others.

We can see no reason for separating this East Indian species generically from the American tarpon. Jordan and Evermann give the backward insertion of the dorsal as the distinguishing character, but this seems to us to be of very little value. In our specimen of *M. cyprinoides* the dorsal is situated over the first one-third of the ventrals, while in *atlanticus* it is over the center or last one-third of these fins.

¹ Bleeker, *Plagiostomen*, p. 85, and Day, *Fish. India*, p. 742.

² *Idem*, p. 87.

³ *Ann. Mag. Nat. Hist.*, ser. 8, vol. 3, 1909, pp. 37-40.

⁴ *Atlas Ichth.*, vol. 6, p. 84, pl. 268, fig. 3.

In some respects these specimens seem to represent the form described by Bleeker as *Megalops kundinga*, but the differences are so slight that no certain decision can be reached without much more material for comparison.

CEIROCENTRUS DORAB (Forakii).

Five specimens, 170 to 330 mm. long. Batavia.

None of these specimens seem to represent the species described by Bleeker¹ as *C. hypselosoma* and we can see no valid differences between these specimens and others in the United States National Museum, which are labeled *C. dorab*.

CHANOS CHANOS² (Forakii).

Five specimens, 220 to 310 mm. long. Batavia.

We have examined specimens from Mazatlan, Hawaii, Samoa, and the Philippines and see no valid differences.

DUSSUMIERIA ACUTA³ (Cuvier and Valenciennes).

Two specimens, 135 and 140 mm. long. Pelaboean Ratoe. Native name given as "Bu-ro-nuk."

DUSSUMIERIA HASSELTII (Bleeker).⁴

Forty-six specimens, about 80 to 150 mm. long. Batavia.

AMBLYGASTER LEIOGASTER⁵ (Cuvier and Valenciennes).

Four specimens, 140 to 150 mm. long, from Batavia represent the species figured as *Clupea (Amblygaster) leiogaster* by Bleeker.

ALOSA KANAGURTA⁶ (Bleeker).

Plates 73-75.

Eighteen specimens, 140 to 170 mm. long. Batavia.

This species does not agree very closely with any of the established genera of Clupeidae and may ultimately stand as the type of a new genus; but, as we are not now prepared to enter into a much-needed revision of the Herring genera, we follow Bleeker in assigning it to *Alosa*, to which it is apparently most closely allied.

The figures of the scales of various Clupeoid genera, plates 73-75, exhibit interesting differences in structure.

HARENGULA GIBBOSA (Bleeker).

Nineteen specimens, 110 to 140 mm. long. Batavia.

These fishes seem to fit about equally well the descriptions and figures of *Clupea (Harengula) gibbosa*, *atricauda*, and *moluccensis* in Bleeker.⁷ The name *gibbosa* seems to be the oldest.

We follow Bleeker in assigning these specimens to the genus or subgenus *Harengula*. *Harengula* and *Sardinella* were apparently

¹ Bleeker, Atlas, Ichth., vol. 6, p. 92, pl. 271, fig. 3.

² Idem, vol. 6, p. 81, pl. 272, fig. 4.

³ Idem, vol. 6, p. 94, pl. 271, fig. 1.

⁴ Idem, vol. 6, p. 95, pl. 271, fig. 2.

⁵ Idem, vol. 6, p. 102, pl. 272, fig. 3.

⁶ Idem, vol. 6, p. 144, pl. 265, fig. 5.

⁷ Idem, vol. 6, pp. 106-7.

both founded on fishes of the same genus unless *Sardinella* was founded on the young of *Clupea*, but the type of the former is easier to determine.

In this group Bleeker has recognized a great number of species which we are utterly unable to separate with the material at hand. Many of our specimens seem to show intermediate characters and it would be only by an examination of a much longer series that they could be separated.

HARENGULA PERFORATA (Cantor).

Plate 75, fig. 1.

Twenty-one specimens, 100 to 140 mm. long. Batavia. These specimens evidently represent the species described by Cantor as *Clupeonia perforata*, but our specimens seem to fit about equally well Bleeker's descriptions of several forms which he puts in several genera.

HARENGULA ARGYROTAENIA (Bleeker).

Two small specimens from Batavia, 71 and 85 mm. long, apparently represent the form described by Bleeker as *Clupea (Harengula) argyrotaenia*.¹ It may also be the same fish as the one described under the name *Clupea dispilonotus*.²

ILISHA INDICA (Swainson).

Plate 75, fig. 3.

Fifteen specimens from Batavia, 90 to 170 mm. long, seem to agree fairly well with the description and figure of this species as given by Bleeker.³

One additional specimen from Pelaboean Ratoe, in very bad shape, seems to be this species. Native name of this specimen given as "Bu-ro-nuk."

ILISHA ELONGATA (Bennett).

One small specimen from Batavia, 90 mm. long, in bad shape, is doubtfully referred to this species on the basis of the descriptions and figures in Bleeker.⁴

OPISTHOPTERUS TARTOOR (Cuvier and Valenciennes).

One specimen from Pelaboean Ratoe, Wynkoop Bay, 140 mm. long. Native name given as "Dow-in-a-wi."

In the discussion of the species Bleeker⁵ expresses doubt as to whether it is the same as the *tartoore* of Russell and suggests the name *O. valenciennesi* if it is different. We are inclined to agree with this conclusion, but have not sufficient material to prove the case.

¹ Atlas Ichth., vol. 6, pl. 264, fig. 5.

² Idem, vol. 6, p. 111, pl. 261, fig. 3.

³ Idem, vol. 6, p. 118, pl. 269, fig. 4.

⁴ Idem, vol. 6, pp. 119-20.

⁵ Idem, vol. 6, p. 123, pl. 263, fig. 5.

ANODONTOSTOMA CHACUNDA¹ (Hamilton-Buchanan).

Eight specimens, 110 to 150 mm. long. Batavia. One specimen in the United States National Museum, No. 56031, from Mindanao, Philippine Islands, seems to represent the variety *selangkat*, but all the others examined by us are typical *chacunda*.

ANCHOVIA INDICA (van Hasselt).²

Twenty-nine specimens, 60 to 120 mm. long. Batavia.

ANCHOVIA COMMERSONII (Lacépède).

Sixty-one specimens, 70 to 120 mm. long. Batavia. *Stolephorus commersonii* or *S. tri*, Bleeker.³ Being unable to distinguish between the two, we use the older name.

ENGRAULIS POORAWAH (Russell).

Seven specimens, 100 to 170 mm. long. Batavia.

This is the species figured under this name by Bleeker.⁴ Day called it *E. hamiltonii*.

We have not seen the figure of *poorawah* of Russell, and the name *poorwah* of Cuvier is not identifiable except he identifies it with the *poorawah* of Russell. Bleeker says that his fish is certainly the *poorawah* of Russell.

We have not located the reference to *Thriessa hamiltonii* Gray, as the only anchovy figured by him in the first volume of the illustrations of Indian Zoology under the name *hamiltonii* seems to be the type of the genus *Coilia*. The reference given by Bleeker is to volume 2, Fish plate 5, while the *Engraulis (Coilia) hamiltonii* is volume 1, Fish plate 2.

ENGRAULIS ENCRASICHOLOIDES (Bleeker).⁵

Two specimens 70 and 130 mm. long. Batavia.

ENGRAULIS MYSTAX⁶ (Bloch and Schneider).

A single specimen, 170 mm. long, was obtained at Batavia.

SAURIDA TUMBIL⁷ (Bloch).

One very poor specimen 90 mm. long. Batavia.

CYPRINUS CARPIO (Linnaeus).

One small specimen, 60 mm. long. Buitenzorg.

Native name given as "Maas."

This species was figured by Bleeker⁸ as *Carpio flavipinnis*.

¹ Bleeker, Atlas Ichth., vol. 6, p. 143, pl. 261, figs. 5 and 6.

² Idem, vol. 6, p. 127, pl. 259, fig. 2.

³ Idem, vol. 6, p. 128, pl. 259, fig. 1, and pl. 262, fig. 1.

⁴ Idem, vol. 6, p. 132, pl. 259, fig. 5.

⁵ Idem, Atlas Ichth., vol. 6, p. 130, pl. 263, fig. 4.

⁶ Idem, vol. 6, p. 132, pl. 261, fig. 3.

⁷ Idem, p. 156, pl. 277, fig. 4.

⁸ Idem, vol. 3, p. 74, pl. 108, fig. 3.

CARASSIUS AURATUS (Linnaeus).

One small specimen, 35 mm. long. Buitenzorg.

Collected by D. G. Fairchild.

Described by Bleeker under many subspecific names but not figured.¹

BARBODES MACULATUS² (van Hasselt).

Eight specimens, 25 to 70 mm. long. Buitenzorg.

All differ from the description in having two instead of three scales between the lateral line and the base of the ventral fins. In this they agree with the form described as *B. goniosoma*, which is probably a synonym of *B. maculatus*. The number of scales between the lateral line and the ventral fins seems to be the only salient character, and this is not constant.

One larger specimen, 110 mm. long, has the lateral line still lower, so that the lower one of the two scales between it and the ventral is quite small.

The native name of all but the largest is given as "Bern-ter," of the largest "Erer-gees."

HAMPALA MACROLEPIDOTA³ (Kuhl and van Hasselt).

One specimen, 150 mm. long. Buitenzorg.

The native name is given as "Ham-pal."

CARPTA LEIACANTHUS⁴ (Bleeker).

One small specimen, 25 mm. long. Buitenzorg.

The native name is given as "Susik-melik."

LEPIDOCEPHALICHTHYS HASSELTII⁵ (Cuvier and Valenciennes).

Four specimens, 40 to 50 mm. long. Buitenzorg.

Also one specimen collected by D. G. Fairchild at Buitenzorg.

NEMACHEILUS FASCIATUS⁶ (Kuhl and van Hasselt).

Four specimens, 55 to 65 mm. long. Buitenzorg.

HEXANEMATICTHYS SUNDAICUS⁷ (Cuvier and Valenciennes).

Seven specimens, 110 to 200 mm. long. Batavia (4) and Pelaboean Ratoe (3).

Show no trace of the whitish cross stripes shown in the figure, but otherwise seem to correspond quite closely with figure and description. The specimens from Pelaboean Ratoe show some difference in the armature and shape of the head.

Native name, Pelaboean Ratoe, "Ka-du-kang."

NETUMA THALASSINA⁸ (Rüppell).

Three specimens about 300 mm. long. Batavia.

¹ Atlas Ichth., vol. 3, p. 75.

² Idem, vol. 3, p. 104, pl. 134, fig. 1; pl. 141, fig. 1; pl. 144, fig. 6.

³ Idem, vol. 3, p. 113, pl. 139, fig. 2.

⁴ Idem, vol. 3, p. 109, pl. 137, fig. 1.

⁵ Idem, vol. 3, p. 13, pl. 103, fig. 2.

⁶ Idem, vol. 3, p. 7, pl. 103, fig. 7.

⁷ Idem, vol. 2, p. 26, pl. 62.

⁸ Idem, vol. 2, p. 23, pl. 61.

PSEUDARIUS ARIUS (Hamilton-Buchanan).

Ten specimens, 60 to 180 mm. long. Batavia (2) and Pelaboean Ratoe (8).

HEMIBAGRUS NEMURUS (Kuhl and van Hasselt).

One partly dried specimen about 250 mm. long and one specimen 110 mm. long. Larger one from Dakok, smaller from Buitenzorg.

HEMIBAGRUS PLANICEPS (?) (Kuhl and van Hasselt).

One specimen, 260 mm. long. Buitenzorg.

One mutilated specimen 220 mm. long taken from the stomach of a snake (identified by Thomas Barbour as *Homalopsis buccata*).

HEMIBAGRUS,⁴ species.

One small specimen, 50 mm. long. Buitenzorg (?).

GLYPTOTHORAX PLATYPOGON (Kuhl and van Hasselt).

Six specimens, 70 to 100 mm. long. Buitenzorg.

Native name "Gae-kel."

CALLICHOUS BIMACULATUS (Bloch).

One specimen, 165 mm. long. Batavia.

CLARIAS TEYSMANNI (Bleeker).

One specimen, about 50 mm. long. Buitenzorg.

Four specimens, each about 20 mm. long, have been provisionally identified as the young of this species.

Native name given as "Lee-le."

CLARIAS BATRACHUS (Bloch).

Two specimens, 140 and 180 mm. long. Buitenzorg.

One fairly large head seems to be referable to this species. Native name, "Lee-le."

CLARIAS, species.

Ten young specimens, each about 20 mm. long. Buitenzorg.

Too small for specific identification at present. Native name, "Lee-le."

MONOPTERUS JAVANENSIS (Lacépède).

Twenty-five specimens, 50 to 450 mm. long. Buitenzorg, 10; Depok, 3; Tjibodas, Mount Gedei, 4,500 feet., 1; ? 11. Native name, "B'lut."

Also one specimen collected by D. G. Fairchild at Buitenzorg.

¹ Bleeker, Atlas Ichth., vol. 2, p. 36, pl. 49.

² Idem, vol. 2, p. 55, pl. 69.

³ Idem, vol. 2, p. 56, pl. 71.

⁴ Idem, vol. 2, p. 54.

⁵ Idem, vol. 2, p. 63, pl. 83, fig. 2.

⁶ Idem, vol. 2, p. 84, pl. 87, fig. 3.

⁷ Idem, vol. 2, p. 104, pl. 99, fig. 1.

⁸ Idem, vol. 2, p. 103, pl. 98, fig. 2.

⁹ Idem, vol. 4, p. 118, pl. 191, fig. 1.

ANGUILLA MAURITIANA¹ (Bennett).

One very large specimen, head and skin about 5 feet long. Buitenzorg.

ANGUILLA SIDAT² (Bleeker).

Two small specimens about 130 and 160 mm. long. Pelaboean Ratoe. Native name, "Or-ling."

MURAENESOX TALABON³ (Cuvier).

One specimen, about 500 mm. long. Batavia.

GYMNOTHORAX PICTUS⁴ (Ahl).

One large specimen (head and skin) about 1 meter long. Batavia.

PANCHAX PANCHAX⁵ (Hamilton-Buchanan).

Twenty-two specimens, 30 to 50 mm. long. Buitenzorg.

Five small specimens about 20 mm. long have been doubtfully referred to this species, although showing some differences in proportions and color which may be due to age. Native name, "Susik-melik."

PAREXOCETUS MENTO⁶ (Cuvier and Valenciennes).

One specimen, 80 mm. long. Batavia.

CYPSILURUS OPISTHOPUS⁷ (Bleeker).

Two specimens, 180 to 190 mm. long. Batavia.

ZENARCHOPTERUS DISPAR⁸ (Cuvier and Valenciennes).

One poor specimen, about 140 mm. long, with most of snout broken off. Batavia.

ZENARCHOPTERUS BUFFONIS⁹ (Cuvier and Valenciennes).

Two good specimens, 160 and 180 mm. long. Batavia. Apparently male and female.

DERMOGENYS PUSILLUS¹⁰ van Hasselt.

Sixty-two specimens, 30 to 50 mm. long, of this small fluviatile form. Buitenzorg.

The description is not sufficiently clear for us to separate this species from *D. sumatranus* in the absence of specimens of the latter. The main differences appear to be variations in depth and in length

¹ Bleeker (*Muraena maculata*), Atlas Ichth., vol. 4, p. 9, pl. 145, fig. 2. Günther (*Anguilla mauritiana*). Cat. Fish. Brit. Mus., vol. 8, p. 26.

² Bleeker, Atlas Ichth., vol. 4, p. 10, pl. 147, fig. 3.

³ Idem, vol. 4, p. 22, pl. 152, fig. 2.

⁴ Idem, vol. 4, p. 87, pl. 170, figs. 3-4; pl. 172, fig. 3; pl. 173, fig. 1; pl. 180, fig. 8.

⁵ Idem, vol. 3, p. 141, pl. 144, fig. 3.

⁶ Idem, vol. 6, p. 77, pl. 261, fig. 6.

⁷ Idem, vol. 6, p. 76, pl. 248, fig. 2.

⁸ Idem, vol. 6, p. 63, pl. 263, fig. 4.

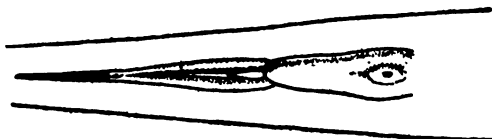
⁹ Idem, vol. 6, p. 62, pl. 264, fig. 3.

¹⁰ Idem, vol. 6, p. 64-66, pl. 263, fig. 1-2.

of head. Bleeker measured 58 specimens of *D. pusillus* and 2 of *D. sumatranus*. The remarkable development of the anal region is here shown in figs. 1 and 2.



1



2

FIGS. 1-2.—ANAL FIN OF MALE *DERMOGENYS PUSILLUS*.
1, VIEW OF RIGHT SIDE; 2, VENTRAL VIEW.

Native name, "Ju-ju-long."

BELONE STRONGYLURA¹ *var*
Hasselt.

Four specimens, each
about 350 mm. long.
Batavia.

BELONE ANNULATA² Cuvier and
Valenciennes.

One specimen, about 350
mm. long. Batavia.

The name *gigantea* Temminck and Schlegel for this species seems to be about four years later than *annulatus*.

SPHYRÆNA JELLO³ Cuvier and Valenciennes.

Seven specimens, 140 to 270 mm. long. Batavia.

SPHYRÆNA OBTUSATA⁴ Cuvier and Valenciennes.

Two small specimens, about 120 mm. long. Batavia.

ATHERINA FORSKALII⁵ Rüppell.

One specimen, 75 mm. long. Batavia.

ATHERINA DUODECIMALIS⁶ Cuvier and Valenciennes.

One small specimen, 70 mm. long. Batavia.

The small amount of material of this very difficult group renders the identification very uncertain.

MUGIL DUSSUMIERI⁷ Cuvier and Valenciennes.

One specimen, 140 mm. long. Batavia.

MUGIL PLANICEPS⁸ Cuvier and Valenciennes.

One specimen, 220 mm. long. Batavia.

AGONOSTOMUS⁹ *BRYANTI* Bean and Weed, new species.

Two specimens, 51 mm. long. Pelaboean Ratoe, Wynkoop's Bay, October, 1909.

¹ Bleeker (*Macacembelus strongylurus*), Atlas Ichth., vol. 6, p. 45, pl. 257, fig. 2.

² Idem, vol. 6, p. 48, pl. 258, fig. 3.

³ Bleeker (Verh. Bat. Gen., vol. 22, 1849, p. 56, of Bijdrage tot de kennis der Percoiden van den Malajo-Molukschen Archipel met beschrijvingen van 22 nieuwe soorten) and Day (Fish. India, p. 342).

⁴ Bleeker (Verh. Bat. Gen., 1849, p. 56) and Day (Fish. India, p. 342, pl. 71, fig. 5).

⁵ Day, Fish. India, p. 345, pl. 71, fig. 4.

⁶ Idem, p. 345.

⁷ Idem, p. 352, pl. 74, fig. 4.

⁸ Idem, p. 350.

⁹ Referred with some doubt to this genus to which it seems most closely allied.

We are informed that there are many small mountain streams flowing into the bay and it is probable that these fish were taken from one of these.

Head, $3\frac{1}{2}$; depth, 4; snout, $5\frac{1}{2}$; eye, $3\frac{1}{2}$; D. V-I, 8; A. III, 8; scales 26-29 in horizontal series, the specimens being in such condition that it is practically impossible to make an accurate count. Teeth in a villiform patch in each jaw, the outer row considerably enlarged. The teeth in the inner rows are so small that they can not be detected by the use of a dissecting needle but are plainly visible under the microscope. Looking directly down on their ends they look like minute papillæ. Papillæ of similar appearance are visible in all parts of the roof of the mouth of the cotype, being especially crowded on the head of the vomer. The teeth of the outer row are strong, conical, abruptly recurved and, perhaps, slightly flattened at the tip. In *Agonostomus monticola* the teeth in the jaws are all recurved, with

FIG. 3.—*AGONOSTOMUS BRYANTI*, NEW SPECIES.

the tip flattened, spoon-shaped, bicuspid or tricuspid. A careful inspection will show all types in the same jaw.

Mouth very small, oblique, the lower jaw strongly projecting. The maxillary does not reach front of eye.

Caudal rounded; soft dorsal opposite anal and similar to it but with slightly shorter base.

Scales ctenoid, a single row of teeth on the edge of each. In *Agonostomus monticola* there are from three to six rows of fine teeth on the outer edge of each scale. An unidentified specimen of *Joturus* has the entire exposed surface of the scale closely covered with fairly strong teeth.

This species differs from all other species of *Agonostomus* of which we can find any description in the small number of scales. The mouth, also, is smaller and directed more upward than in others. The teeth are apparently larger than *A. monticola*.

Color in alcohol uniform pale brownish.
The dorsal fins were apparently black in life.
Type-Specimen.—Cat. No. 72582, U.S.N.M.

RACHYCENTRON CANADUS (Linnaeus).

One specimen, 170 mm. long. Batavia.

DREPANE PUNCTATA¹ (Linnaeus).

Two specimens, 90 and 160 mm. long. Batavia.

The smaller specimen has four free spines before the dorsal. These are apparently articulated directly to the supraoccipital crest. Traces of them can be seen in the largest specimen.

PLATAX TEIRA² (Forsskal).

Three specimens, 180 to 200 mm. long. In very poor color. Batavia.

MEGALASPIS ROTTLEI³ (Bloch).

Thirty-six specimens, 100 to 150 mm. long. Batavia, 26; Pelaboean Ratoe, 10.

Described as *Scomber rottleri* by Bloch, which some authors have identified with the *Scomber cordyla* of Linnaeus. We are unable to decide in regard to the latter name, so use that of Bloch. The presence of finlets and the increased caudal armature seem to us sufficient grounds for generic separation.

CARANX FORSTERI Cuvier and Valenciennes.

Three specimens, 230 mm., 235 mm., 290 mm. Batavia.

We have examined all the specimens of this and related species in the United States National Museum and have reached the following conclusions:

Caranx latus Agassiz is a very different species, with more soft rays in dorsal and anal, with long snout, fewer scutes, and the curved and straight parts of the lateral line about equal in extent.

Caranx elacata is probably this species, also *C. marginatus* and the type of *C. rhabdotus*. The cotype of *C. rhabdotus* is quite different from the type in many characters and is probably a different species. Both are very young. Specimens from Hawaii were first identified as *C. latus* and later published as *C. forsteri*. They are apparently all *C. melampyrgus*.

Caranx parapistes Richardson is probably *C. forsteri*, as also *C. herberti* of Bennett.

Caranx melampyrgus of Day (Fishes of India) is apparently a mixture of *C. forsteri* and *C. melampyrgus*. He probably had both species

¹ Bleeker (*Harporhynchus punctatus*), Atlas Ichth., vol. 9, p. 19, pl. 365, fig. 4.

² Idem, vol. 9, p. 73, pl. 379, fig. 2, and pl. 382, fig. 1.

³ The specimens of Carangidae and Scombridae in this collection were examined by Mr. J. T. Nichols of the American Museum, New York. Our identifications agree with those of Mr. Nichols except in a very few cases where a more complete series for comparison has shown some obvious differences.

at hand and confused them, a thing quite easy to do unless the length of the snout and maxillary, number of rays in dorsal and anal, and number of scutes are noted. The shape of the curved part of the lateral line is also different in the two.

CARANX DJEDABA (Forsk.).

Twenty-seven specimens, 90 to 180 mm. long. Batavia.

One specimen is aberrant in head and depth, but the others appear to form a very natural group.

This is possibly different from the *Caranx djeddaba* of Rüppell,¹ which has a larger fin count in dorsal and anal. It is the *Caranx djeddaba* of Day and the *Selar kuhlii* of Bleeker.²

The *Caranx vari* of Cuvier and Valenciennes may be the same as the *C. djeddaba* of Rüppell.

CARANX KALLA Cuvier and Valenciennes.

One specimen, 95 mm. long. Batavia.

This specimen is very young and lacks the falcate pectoral which appears in young of other species at similar sizes. It seems to be, however, the *Caranx kalla* of Cuvier and Valenciennes and the *Caranx brevis* of Bleeker and of Günther. The *Caranx calla* of Günther may be a different species with a shorter head.

CARANX LEPTOLEPIS (Cuvier and Valenciennes).

One specimen, 130 mm. long. Batavia.

This fish was identified by Nichols as *C. georgianus*, but an examination of specimens of *georgianus* from Australia, the type-locality, shows that the latter are a different species with longer head, greater depth, smaller eye, longer snout, fewer gill-rakers, and fewer scutes. Also the scutes on the Australian specimens are much larger.

This specimen agrees well with the description of *C. leptolepis*, the type of which came originally from Java, except that the snout is a little shorter than there recorded. This discrepancy may be partly due to differences in method of measurement. If the snout of our specimen is measured from the front edge of the iris it is equal in length to the diameter of the iris.

CARANX IRE (Cuvier and Valenciennes).

One specimen, 130 mm. long. Batavia.

Our specimen differs somewhat from a Philippine specimen also identified as *C. ire* in head and depth, but we lack material to settle the matter. Either specimen fits the descriptions fairly well.

CARANX ATROPUS (Bloch and Schneider).

Two specimens, each 75 mm. long. Batavia.

The head is considerably longer and the ventral fins much shorter than in current descriptions. In some respects these fish seem to be

¹ Atlas Fische, p. 97.

² Makreelaartigen Fische, p. 54.

closer to Günther's description of *Caranx talamparoides* Bleeker. The latter is, however, probably more slender.

CARANX MALABARICUS (Bloch and Schneider).

Two specimens, 165 mm. and 270 mm. long. Batavia.

In spite of some discrepancies these specimens seem to conform fairly well to the published descriptions.

CARANX OBLONGUS (?) (Cuvier and Valenciennes).

One specimen, 175 mm. long. Batavia.

Our fish seems to fit the descriptions of this species fairly well except that the first anal ray is about as long as the first dorsal ray.

A specimen from New Guinea labeled *C. oblongus* is not this species and we have not yet been able to identify it.

CARANX ARMATUS (Forsk.)

Two specimens, 110 and 150 mm. long. Batavia.

This species is quite distinct from *Otitula dorsalis* Gill, with which Mr. Nichols compares it.

Specimens from the Philippines labeled *C. armatus* seem to be the same species as those identified as *C. atropus* by Mr. Nichols and ourselves.

CARANX MALAM (Bleeker).

Two specimens, 170 and 180 mm. long. Batavia.

These specimens are the *Caranx nigripinnis* of Day, which seems to be certainly a synonym of *Selar malam* of Bleeker.

ALECTIS INDICUS (Bloch).

Two specimens, each about 150 mm. long.

The genus *Alectis*, proposed by Rafinesque as a substitute for *Gallus* Lacépède, was probably based on this species. Lacépède's description of *Gallus virescens* could apply either to this species or to *ciliaris*, but Cuvier and Valenciennes say that he had seen only specimens from the Indian Ocean, where this species is quite common and *ciliaris* is rather rare.

Cuvier and Valenciennes describe this species under five names: *Scyris indicus*,¹ *Scyris alexandrinus*,² *Gallichthys major*,³ *Gallichthys chevala*,⁴ and *Gallichthys ægyptiacus*.⁵ *Ciliaris* was described by these authors under three names: *Blepharis indicus*,⁶ *Blepharis sutor*,⁷ and *Blepharis major*.⁸

The description of *Scyris indicus* fits our fish with sufficient exactness and the type of that fish came from Java.

If we are correct in our translation, the very brief description of *Zeus gallus* given by Linnæus refers not to the present species but to the *ciliaris* of Bloch.

¹ Hist. des Poissons, vol. 9, p. 145.

² Idem, vol. 9, p. 152.

³ Idem, vol. 9, p. 168.

⁴ Idem, vol. 9, p. 175.

⁵ Idem, vol. 9, p. 176.

⁶ Idem, vol. 9, p. 154.

⁷ Idem, vol. 9, p. 161.

⁸ Idem, vol. 9, p. 163.

LACTARIUS LACTARIUS (Bloch and Schneider).

Thirteen specimens, 80 to 160 mm. long. Batavia, 11; Belaboean Ratoe, 2.

SCOMBEROIDES TOL (Cuvier and Valenciennes).

Twenty-one specimens, 100 to 200 mm. long. Batavia.

These fish are the same species as the one figured under the name *moadetta* by Day.

They are quite different from the Hawaiian specimens described as *sancti-petri* which have the scales lanceolate instead of linear as in the Javan specimens.

The Hawaiian specimens are undoubtedly properly identified with the *S. sancti-petri* of Cuvier and Valenciennes.

SCOMBEROIDES LYSAN (Forssk.).

Ten specimens, 120 to 190 mm. long. Batavia.

These specimens are easily separable at a glance from the two more slender forms, *S. tol* and *S. sancti-petri*.

The fishes belonging to the genera *Scomberoides* and *Oligoplites* are so similar in form that on external characters they seem to constitute but a single genus. However, the American species have only 4-5 (occasionally 6) spines in the first dorsal (it is possible that all the counts of 6 have been made by including the last procumbent spine), while those of Asia and Africa have 6 or 7 spines (probably 6 by atrophy of the first). This character would not be worthy of generic rank if it were not supported by other anatomic ones. The scales in all the American forms are linear, while they are lanceolate in all the African and Asiatic ones except *S. tol*, which has them linear.

The most important character is one that was first mentioned and figured by Lütken in *Spolia Atlantica*,¹ the arrangement of the teeth in the roof of the mouth. In both there is practically a continuous band of teeth across the head of the vomer, the entire length of the palatine and on the upper arm of the pterygoid. In addition to this *Scomberoides* has a broad patch of teeth on the mesopterygoid. We quote Lütken's statement from the English edition:

For the subdivision of this genus it would be best to employ a difference hitherto unnoticed, namely, the existence or absence of teeth on the pterygoids side by side with those of the palatines and vomer, in accordance with the following scheme, the divisions of which must, however, only be estimated as sections or subgenera, and not as true genera.

A. 4-5 (6) dorsal spines; scales linear; no teeth on the pterygoids. *C. occidentalis*, *saliens*, *palometa* (*Oligoplites*, Gill).

B. 7 dorsal spines, and teeth on the pterygoids. 1. Scales linear: *C. tol* (*C. moadetta*, Klz., perhaps the young form of *C. tol*). 2. Scales short and broad: *C. lyson*, *sancti Petri*, and a new species from Singapore which greatly resembles *C. altus* of the western coast of Central America.

¹ Dansk. Vid. Selsk. Skr., vol. 12, 1880, pp. 413-613, pls. 1-5, translated in Ann. Mag. Nat. Hist., ser. 5, vol. 7, 1881, pp. 1-14, 107-123.

There is a considerable difference in number and arrangement of gill-rakers in the various species of *Oligoplites* and *Scomberoides*, but it seems to have no generic value.

The genus *Eleria* Jordan and Seale, based on the presence near the symphysis of the mandible of a pair of diverging canine teeth, is a synonym of *Scomberoides*. These teeth are matched by a similar pair in the upper jaw of specimens less than 150 mm. long. Soon after reaching this size the mandibular pair of canines disappear while those on the premaxillary persist until the fish is about 180 mm. long.

Eleria philippina, the type-species, is a synonym of *Scomberoides lysan*.

SCOMBER KANAGURTA (Russell).

Twenty-eight specimens, 110 to 200 mm. long. Batavia.

Identified by J. T. Nichols as *S. brachysoma* and *S. microlepidotus*. *Scomber brachysoma* Bleeker is an exceedingly rare fish in Java (Bleeker had only one specimen) and differs from all of these specimens in much greater depth and in the absence of all spotting on the back.

Scomber microlepidotus is apparently the young of *S. chrysozonus*, and this name is therefore not tenable.

We have examined in addition to these Java fish, one which was identified by Bleeker as *Scomber kanagurta*, two identified by Alvin Seale as *S. loo*, and eight identified by Seale as *S. microlepidotus*. The ones called *loo* are much larger and show a slightly different color pattern, but otherwise we can see no other specific differences in any grouping of the entire lot. We are entirely unable to determine the basis of Nichols's division of the specimens he examined.

We have carefully examined the paper by Dr. P. N. Van Kampen,¹ and agree with him that *Scomber kanagurta*,² *S. loo*, *S. microlepidotus*, *S. moluccensis*, *S. chrysozonus*, and *S. reani*, should all be included under the single name *S. kanagurta*, but we differ from him in including his *S. neglectus* in the list.

Another specimen (No. 56090) labeled *Scomber brachysoma* (probably identified by Alvin Seale) is evidently Van Kampen's *S. neglectus*, which we include in *S. kanagurta*, as our specimens from Batavia, Java, show all the intermediate conditions.

Mr. E. C. Starks, after an examination of the skull of each of these species and of *Scomber scombrus*, said that he saw no reason in this case for generic separation of the two. This leaves *brachysoma* alone in the genus *Rastrelliger*.

¹ Bull. Dept. Agr. Ind. Néerl., No. 8, Zool., pt. 2, 1907.

² For bibliography of *Scomber kanagurta*, especially revisions, see P. N. Van Kampen, Bull. Dept. Agr. Ind.-Néerl., No. 8 (Zool., pt. 2), 1907; Klunzinger, Verh. Zool.-Bot. Ges. Wien, vol. 21, 1871, p. 441; H. W. Fowler, Proc. Acad. Nat. Sci. Phila., vol. 56, 1904, p. 757.

GYMNOSARDA ALLETERATA (Rafinesque).

Four specimens, three about 250 mm. each, one about 300 mm. long. Batavia.

AUXIS THAZARD (Lacépède).

One specimen, 240 mm. long. Batavia.

SCOMBEROMORUS COMMERSONII (Lacépède).

Six specimens, 170 to 230 mm. long. Batavia.

SCOMBEROMORUS GUTTATUS (Bloch and Schneider).

Two specimens, 110 and 170 mm. long and three doubtful, 55, 170, and 180 mm. long. Batavia.

So far as we can identify them, there are six specimens of *S. commersonii* in the collection. The others are not this form but might with equal propriety be assigned to any one of four species: *S. kuhlii*, *S. guttatus*, *S. lineolatus*, and *S. interruptus*, all of which may ultimately be assigned the same name. We have, therefore, used the oldest name, *Scomberomorus guttatus*.

TRICHIURUS HAUMELA (Forakii).

Seven specimens, 140 to 280 mm. long. Batavia.

These specimens are labeled *Trichiurus haumela*, to which species they probably belong if, as seems rather doubtful, this and *T. japonicus* are really specifically distinct from *T. lepturus*. We do not have a sufficient series of specimens to determine this point. *T. cozi*,¹ of which we have two specimens, shows some characters which may prove of value.

We have three specimens, apparently *T. muticus*, which show the common characters of a more nearly straight lateral line and of the presence of minute scales indicating the position of the reduced ventral fins. These scales are almost invisible to the naked eye, but are readily apparent under a lens when their position has been shown by the use of a very fine dissecting needle. A coarser needle would be apt to destroy them without giving an indication of their presence. We have not been able to find these scales in other specimens examined.

The species of *Trichiurus* are so very similar in appearance and the various individuals of a single species show such great differences, especially in depth of body and in relative length of the various sections of the body, that it is probable we must look for differential characters in the internal anatomy or else greatly reduce the number of nominal species.

Trichiurus lepturus is plainly distinguished from *T. muticus* by its larger size, lack of ventral scales, more elongate (less markedly triangular) head and much stronger dentition. Also, the lateral line

¹ Ramsay and Ogilby, Proc. Linn. Soc. N. S. Wales (2), vol. 2, p. 562.

is more angled about opposite the end of the pectoral. In *T. muticus* the lateral line is nearly straight. *Trichiurus savala* may be small specimens of *T. "haumela"* or of *T. muticus* and may ultimately prove unidentifiable. *Trichiurus nitens* Garman¹ is possibly not distinct from *T. lepturus*.

STROMATEUS SINENSIS Euphrasen.

Ten specimens, 100 to 180 mm. long. Batavia.

One with an isopod (*Cymothoa stromatei* Bleeker) in the mouth.

LEIOGNATHUS BINDOIDES (?) Bleeker.

One specimen, 75 mm. long. Batavia.

LEIOGNATHUS EDENTULUS (Bloch).

Seven specimens, 80 to 100 mm. long. Batavia.

LEIOGNATHUS INSIDIATOR (Bloch).

One specimen, 75 mm. long. Batavia.

LEIOGNATHUS GERREOIDES (Bleeker).

Eight specimens, 85 to 110 mm. long. Batavia.

LEIOGNATHUS SPLENDENS (Cuvier).

Twenty-one specimens, 80 to 130 mm. long. Batavia.

Two doubtful specimens, each 75 mm. long. Binoeangen.

GAZZA MINUTA (Bloch).

Eight specimens, seven about 90 mm. long, the other about 130 mm. long. Batavia, 7; Pelaboean Ratoe, 1.

AMBASSIS NALUA² (Cuvier and Valenciennes).

One specimen 70 mm. long and one doubtful, 60 mm. long.

Best specimen from Batavia, other from Welcome Bay, Bantam.

AMIA QUADRIFASCIATA (Cuvier and Valenciennes).

One specimen, 95 mm. long. Batavia.

Shows some characteristic vertical bars below the lowest horizontal stripe, which are not shown in Bleeker's figure.³

AMIA AMBOINENSIS⁴ (Bleeker).

One specimen, 120 mm. long. Batavia.

EPINEPHELUS ONGUS⁵ (Bloch).

Two specimens, 280 and 300 mm. long. Batavia.

EPINEPHELUS VARIOLOSUS⁶ (Cuvier and Valenciennes).

One specimen, 200 mm. long. Batavia.

Two other specimens, 220 and 290 mm. long, have been doubtfully referred to this species.

¹ Mem. Mus. Comp. Zool., vol. 26, p. 69.

² Bleeker, Atlas Ichth., vol. 8, p. 136, pl. 854, fig. 6.

³ Idem, vol. 7, p. 88; vol. 8, pl. 335, fig. 1.

⁴ Idem, vol. 7, p. 90; vol. 8, pl. 346, fig. 1.

⁵ Idem, vol. 7, p. 64, pl. 282, fig. 2. Not pl. 342, fig. 3.

⁶ Idem, vol. 7, p. 40, pl. 300, fig. 3.

EPINEPHELUS SEKFASCIATUS¹ (Kuhl and van Hasselt).

One specimen, 220 mm. long. Batavia.

EPINEPHELUS PANTHERINUS² (Lacépède).

Four specimens, 140 to 250 mm. long. Batavia.

EPINEPHELUS GILBERTI³ (Richardson).

One specimen, 240 mm. long. Batavia.

EPINEPHELUS MERRA⁴ Bloch.

Two specimens, 170 and 260 mm. long. Batavia.

THERAPON PUTA⁵ (Cuvier and Valenciennes).

Three specimens, 120 to 130 mm. long. Batavia.

THERAPON JARBUA⁶ (Forakål).

Three specimens, 90 to 130 mm. long. Welcome Bay, Bantam, 1; Batavia, 2.

THERAPON THERAPS⁷ Cuvier and Valenciennes.

Six specimens, 30 to 150 mm. long. Batavia.

PLECTORHYNCHUS PICTUS⁸ (Thunberg).

Two specimens, 190 to 200 mm. long. Batavia.

Adult of this species.

PLECTORHYNCHUS CHETODONOIDES⁹ (Lacépède).

One specimen, 300 mm. long, in adult coloration. Batavia.

SCOLOPSIS BIMACULATUS¹⁰ (Rüppell).

One specimen, 190 mm. long. Batavia.

SCOLOPSIS TÆNIOPTERUS¹¹ (Kuhl and van Hasselt).

One specimen, 230 mm. long. Batavia.

SCOLOPSIS MARGARITIFER¹² Cuvier and Valenciennes.

Three specimens, each about 190 mm. long. Batavia.

POMADASTS NAGEB¹³ (Rüppell).

One specimen, 250 mm. long. Batavia.

There is some discrepancy between the description and the figure in regard to scale count. The fish at hand has about 40 scales in a horizontal series *below* the lateral line and about 56 in and above lateral line. The description calls for about 40 scales *in* the lateral line. In the figure are shown 56 scales in and above the lateral line and about 50 below.

¹ Bleeker, *Atlas Ichth.*, vol. 7, p. 60, pl. 281, fig. 2.

² Idem, vol. 7, p. 51, pl. 286, fig. 1.

³ Idem, vol. 7, p. 56; vol. 8, pl. 351, fig. 3.

⁴ Idem, vol. 7, p. 55, pl. 301, fig. 2.

⁵ Idem, vol. 7, p. 112; vol. 8, pl. 340, fig. 2.

⁶ Idem, vol. 7, p. 112, pl. 312, fig. 2.

⁷ Idem, vol. 7, p. 113; vol. 8, pl. 321, fig. 1.

⁸ Idem, vol. 8, p. 24, pl. 329, fig. 4; pl. 333, fig. 2.

⁹ Idem, vol. 8, p. 17, pl. 301, fig. 3; pl. 308, fig. 2.

¹⁰ Idem, vol. 7, pl. 314, fig. 1; vol. 8, p. 10.

¹¹ Idem, vol. 8, p. 10, pl. 343, fig. 5.

¹² Idem, vol. 8, p. 3, pl. 317, fig. 2.

¹³ Idem, vol. 8, p. 29, pl. 351, fig. 4.

LUTJANUS CHIRTAH¹ (Cuvier and Valenciennes).

Five young specimens, 80 to 160 mm. long. Batavia.

LUTJANUS VITTA² (Quoy and Gaimard).

One specimen, 170 mm. long. Batavia.

LUTJANUS RUSSELLI³ (Bleeker).

Two specimens, each about 180 mm. long. Batavia.

LUTJANUS FULVIFLAMMA⁴ (Forssk.).

Two specimens, 250 and 300 mm. long. Batavia.

The most salient difference between these specimens and the description and figure is in the distal edge of the anal fin, which is described as being curved. Our specimens show it almost perfectly straight.

CÆSIO CÆRULAUREUS⁵ Lacépède.

One specimen, 170 mm. long. Batavia.

CÆSIO LUNARIS⁶ (Ehrenberg).

Six specimens, 130 to 220 mm. long. Batavia.

All these specimens have a narrow band or a single row of teeth on the palatine or pterygoid. This patch is so narrow that it can not be found by the use of an ordinary dissecting needle, but is detected at once by the use of an edge as a scraper in the roof of the mouth.

SPARUS DATNIA⁷ (Hamilton-Buchanan).

One specimen, 110 mm. long. Palaboean Ratoe.

The native name is given as "Sing-rung."

GERRES MACRACANTHUS⁸ Bleeker.

Two specimens, 90 and 110 mm. long. Batavia.

OTOLITHUS ARGENTEUS⁹ Kuhl and van Hasselt.

Five specimens, 100 to 260 mm. long. Batavia.

PSEUDOSCLÆNA ANÆUS¹⁰ (Bloch).

Five specimens, 65 to 150 mm. long. Batavia.

PSEUDOSCLÆNA PLAGIOSTOMA¹¹ (Bleeker).

Two specimens, each 120 mm. long. Batavia.

UMBRINA MACROPTERA¹² Bleeker.

Two specimens, 140 and 150 mm. long. The dorsal rays are 20-24. Palaboean Ratoe.

¹ Bleeker, Atlas Ichth., vol. 8, p. 68, pl. 301, fig. 1.

² Idem, vol. 8, p. 51, pl. 340, fig. 5.

³ Idem, vol. 8, p. 71, pl. 300, fig. 2.

⁴ Idem, vol. 8, p. 65, pl. 344, fig. 3.

⁵ Idem, vol. 8, p. 39, pl. 347, fig. 4.

⁶ Idem, vol. 8, p. 37, pl. 334, fig. 4.

⁷ Idem, vol. 8, p. 109, pl. 361, fig. 4.

⁸ Idem, vol. 8, p. 125, pl. 362, fig. 1.

⁹ Idem, vol. 9, pl. 385, fig. 5, and Day, Fishes of India, p. 197, pl. 45, fig. 3.

¹⁰ Idem, vol. 9, pl. 385, fig. 2, and Day (*Sciaenæ anæus*), Fishes of India, p. 189, pl. 45, fig. 5.

¹¹ Idem, vol. 9, pl. 385, fig. 1.

¹² Day, Fishes of India, p. 182, and figured by Bleeker as *Sciaenæ macroptera*, Atlas Ichth., vol. 9, pl. 384, fig. 5.

UMBRINA RUSSELLII¹ (Cuvier and Valenciennes).

One specimen, 130 mm. long. Batavia.

SILLAGO SIHAMA² (Forsk.).

Two specimens, 135 and 145 mm. long. Batavia.

UPENEUS VITTATUS³ (Forsk.).

One specimen, 90 mm. long, much discolored. Batavia.

UPENEUS SUNDAICUS⁴ (Bleeker).

One specimen, 105 mm. long. Batavia.

UPENEUS TRAGULA⁵ (Richardson).

One specimen, 240 mm. long. Batavia.

UPENEUS SULPHUREUS⁶ (Cuvier and Valenciennes).

Thirteen specimens, 65 to 120 mm. long. Batavia.

ACANTHOCHÆTODON ANNULARIS⁷ (Bloch).

One specimen, 240 mm. long. Batavia.

The preservative has turned this specimen very dark, but the color pattern is quite distinct.

SIGANUS CORALLINUS⁸ (Cuvier and Valenciennes).

Two small specimens, 65 and 80 mm. long. Batavia.

SIGANUS GUTTATUS (Bloch).

Two specimens, 210 and 230 mm. long. Batavia.

SIGANUS VIRGATUS (Cuvier and Valenciennes).

Seven specimens, 120 to 200 mm. long. Batavia.

SIGANUS JAVUS (Linnaeus).

Three specimens, 150, 170, and 190 mm. long. Batavia.

TRICHOPODUS TRICHOPTERUS⁹ (Pallas).

Two specimens, 90 and 95 mm. long. Batavia.

Also one small specimen from Buitenzorg, collected by D. G. Fairchild.

CTENOPS STRIATUS¹⁰ (Bleeker).

Eighteen specimens, 15 to 60 mm. long. Buitenzorg.

OPHIOCEPHALUS MELANOPTERUS¹¹ (Bleeker).

Two specimens, 65 and 130 mm. long. Buitenzorg, 1; Pelaboean Ratoe, 1.

Native names "Gar-hus" and "Bo-kan."

¹ Day, Fishes of India, p. 183, pl. 43, fig. 4, and Bleeker (*Sciæna russelli*), Atlas Ichth., vol. 9, pl. 386, fig. 2.

² Bleeker, Atlas Ichth., vol. 9, pl. 389, fig. 4.

³ Idem, vol. 9, pl. 392, fig. 3.

⁴ Idem, vol. 9, pl. 394, fig. 2.

⁵ Idem, vol. 9, pl. 392, fig. 2.

⁶ Idem, vol. 9, pl. 393, fig. 4.

⁷ Idem, vol. 9, p. 71, pl. 370, figs. 1, 2.

⁸ Bleeker, Verh. Bat. Gen., vol. 23, 1850, Bijdrage tot de kennis der Teuthiden van den Soenda-Molukischen Archipel, p. 11.

⁹ Bleeker, Atlas Ichth., vol. 9, pl. 395, fig. 4.

¹⁰ Idem, vol. 9, pl. 396, fig. 4.

¹¹ Idem, vol. 9, pl. 398, fig. 2.

OPHIOCEPHALUS GACHNA¹ (Hamilton-Buchanan).

Sixteen specimens, 60 to 170 mm. long. Buitenzorg, 7; Goenoeng Boender, Mount Salak, 2,400 feet, 8.

Although not so figured, it is probable that in life the vertical fins of this species are all more or less cross barred with black.

Also two specimens from Buitenzorg, collected by D. G. Fairchild, are doubtfully referred to this species.

Native name "Bo-go."

POMACENTRUS ANABATOIDES² (Bleeker).

Three poorly preserved specimens, each about 110 mm. long.

POMACENTRUS, species.

Two specimens, 20 mm. long. Pelaboean Ratoe.

Too small for identification under present conditions.

HELLASTES LEPIDURUS³ (Cuvier and Valenciennes).

One poorly preserved specimen, about 90 mm. long. Batavia.

HEMITAUTOGA NOTOPHTHALMUS⁴ (Bleeker).

One small specimen, 70 mm. long. Pelaboean Ratoe.

CHELINUS CHLORURUS⁵ (Bloch).

One specimen, 170 mm. long. Batavia.

PSEUDOSCARUS VIRIDIS⁶ (Bloch).

Five specimens, each about 180 mm. long. Batavia.

PSEUDOSCARUS RIVULATUS⁷ (Kuhl and van Hasselt).

Two specimens, 180 and 210 mm. long. Batavia.

PSEUDOSCARUS CANTORI⁸ (Bleeker).

One specimen, 180 mm. long. Batavia.

This specimen has one "angular" tooth.

It is quite possible that *Pseudoscarus viridis*, *P. rivulatus*, and *P. cantori* are all color varieties or color phases of the same species.

PLATYCEPHALUS INDICUS⁹ (Linnaeus).

Two specimens, 300 and 450 mm. long. Batavia.

This species has been described under the name *Platycephalus insidiator* by many authors.

PLATYCEPHALUS SCABER¹⁰ (Linnaeus).

One specimen, 190 mm. long. Batavia.

¹ Bleeker, Atlas Ichth., vol. 9, pl. 397, fig. 4.

² Idem, vol. 9, pl. 407, fig. 7.

³ Idem, vol. 9, pl. 403, fig. 7; Günther, *Fische Sudsee*, p. 238, pl. 128, figs. C, D; and Day, *Fishes of India*, p. 389, pl. 82, fig. 1.

⁴ Idem, vol. 1, p. 140, pl. 21, fig. 1.

⁵ Idem, vol. 1, p. 65, pl. 27, fig. 3.

⁶ Idem, vol. 1, p. 45, pl. 17, fig. 3.

⁷ Idem, vol. 1, p. 44, pl. 9, fig. 3.

⁸ Idem, vol. 1, p. 43, pl. 9, fig. 2.

⁹ Idem, vol. 9, pl. 418, fig. 3, 3a, and Jordan and Richardson, *Proc. U. S. Nat. Mus.*, vol. 33, p. 641.

¹⁰ Idem, vol. 9, pl. 419, fig. 5, 5a.

BATRACHOMGEUS TRISPINOSUS (Günther).

One specimen, 160 mm. long. Batavia.

GLOSSOGOBIOUS GIURUS¹ Hamilton-Buchanan.

One specimen, 170 mm. long. Batavia.

KELLOGGELLA, species.

One specimen, 27 mm. long.

Seems to represent an undescribed species of *Kelloggella*, but is in such poor condition that no valid description of it can be made. It had apparently been very extensively dried before reaching us. The teeth are as in the type of *Kelloggella cardinalis*, tricuspid, narrower and much longer in the upper than in the lower jaw. In one row above and several rows below, at least in the front of the lower jaw.

This fish may have been more slender than *K. cardinalis*; the caudal and ventral fins seem to be more pointed, and the tips of the fin rays seem to have been free.

One specimen labeled "Pelaboean Ratoe, Preanger, Oct. 1909."

SALARIAS CAUDOLINEATUS Günther.

Three specimens, each about 40 mm. long. Pelaboean Ratoe, 2; Triperwageran, Bantam, 1.

Two agree with Günther,³ the other with Kendall and Goldsborough.⁵ We can detect no specific differences between the two forms.

SALARIAS QUADRICORNIS⁴ Cuvier and Valenciennes.

Two specimens, 40 and 55 mm. long. Pelaboean Ratoe, 1; Triperwageran, Bantam, 1.

SALARIAS NATALIS Regan.

Three specimens, 45, 48, and 55 mm. long. Pelaboean Ratoe. Regan.⁵

SALARIAS TRIDACTYLUS⁶ (Bloch and Schneider.)

Eight specimens, 40 to 85 mm. long. Pelaboean Ratoe.

One very large male had the occipital crest trifid and the fins all very high. In this specimen the color had become so intense that practically all traces of markings had become obscured. Some traces of what had apparently been very small blue spots remained.

SALARIAS MARMORATUS (?)⁷ Bennett.

One small specimen, 35 mm. long. Pelaboean Ratoe.

¹ Bleeker, Blenn. Gob., p. 24, and Day, Fishes of India, p. 294, pl. 46, fig. 1.

² Fische Sudsee, p. 209, pl. 116, fig. F.

³ Mem. Mus. Comp. Zool., vol. 26, No. 7, p. 326.

⁴ Günther, Fische Sudsee, p. 209, pl. 117, fig. B.

⁵ Proc. Zool. Soc. London, 1909, pt. 2, p. 405, pl. 66, fig. 4.

⁶ Günther, Fische Sudsee, p. 200, pl. 117, fig. C, D.

⁷ Idem, p. 204, pl. 116, fig. B.

SALARIAS LINEATUS (?)¹ Cuvier and Valenciennes.

One small specimen, 35 mm. long. Pelaboean Ratoe.

Appears much discolored. The color pattern is almost entirely obscured but seems to agree with the descriptions. The most serious discrepancies are in the length of the head and in the depth, but these may be due to age and the method of preservation and of measurement.

POLYNEMUS TRIDACTYLUS Bleeker.

One specimen, 240 mm. long. Batavia.

POLYNEMUS TETRADACTYLUS Shaw.

Four specimens, 140 to 300 mm. long. Batavia.

POLYNEMUS HEPTADACTYLUS Cuvier and Valenciennes.

One specimen, 70 mm. long. Batavia.

POLYNEMUS MELANOCHIR² Cuvier and Valenciennes.

Two specimens, 160 and 170 mm. long. Pelaboean Ratoe.

Native name "Char-wen-e-kerning."

ECHENEIS NAUCRATES Linnaeus.

Four specimens, 190 to 250 mm. long. Batavia.

PSEUDORHOMBUS MALAYANUS³ Bleeker.

Six specimens, 130 to 200 mm. long. Batavia.

PSETTODES ERUMEI⁴ (Bloch and Schneider).

Five specimens, 200 to 230 mm. long. Batavia.

All but one had one or more large isopods (*Cymothoa stromatei* Bleeker) in the mouth. Three with eyes and color on the right side.

CYNOGLOSSUS MACROLEPIDOTUS⁵ (Bleeker).

Two specimens, each about 200 mm. long. Batavia.

CYNOGLOSSUS POTOUS⁶ (Cuvier).

Four specimens, 180 to 350 mm. long. Batavia.

CYNOGLOSSUS BRACHYRHYNCHUS⁷ (Bleeker).

One specimen, 100 mm. long. Batavia.

CYNOGLOSSUS QUADRILINEATUS⁸ (Kahl and van Hasselt).

Ten specimens, about 250 mm. long. Batavia.

PARAPLAGUSIA MARMORATA⁹ Bleeker.

One specimen, 160 mm. long. Batavia.

¹ Günther (*S. lineatus*), Cat. Fish. Brit. Mus., vol. 3, p. 254; Day, Fish. India, p. 332, pl. 70, fig. 8, and Bleeker, Gob. en Bienn., p. 18.

² Bleeker, Verh. Bat. Gen., vol. 22, 1849, Bijdraget tot de kennis der Percoiden van den Maleijë-Mohab-schen Archipel met beschrijvingen van 22 nieuwe soorten.

³ Bleeker, Atlas Ichth., vol. 6, p. 7, pl. 234, fig. 2.

⁴ Idem, vol. 6, pl. 232, fig. 2.

⁵ Idem, vol. 6, p. 34, pl. 242, fig. 2.

⁶ Idem, vol. 6, p. 33, pl. 241, fig. 4.

⁷ Idem, vol. 6, p. 37, pl. 243, fig. 4.

⁸ Idem, vol. 6, p. 32, pl. 245, fig. 3.

⁹ Idem, vol. 6, p. 28, pl. 246, fig. 3.

ESOPIA ZEBRA¹ (Bloch).

One specimen, 170 mm. long. Batavia.

We see no reason for considering *Solea zebrina* Temminck and Schlegel distinct from *Pleuronectes zebra* Bloch. Bloch's figure is very poor but seems to represent this species.

HIPPOCAMPUS TRIMACULATUS Leach.

Two specimens, each about 100 mm. long. Pelaboean Ratoe.

Native name, "Tang-kor."

TRIACANTHUS BREVIROSTRIS² Temminck and Schlegel.

One specimen, 165 mm. long. Batavia.

TRIACANTHUS BLOCHII³ Bleeker.

One specimen, 125 mm. long. Batavia.

This specimen shows some differences of color from Japanese specimens called *T. blochii*, but this may be due to different methods of preservation.

TRIACANTHUS NIEBUHOFII⁴ Bleeker.

One young specimen, 50 mm. long. Pelaboean Ratoe.

TETRAODON OBLONGUS⁵ Bloch.

Two specimens, 40 and 100 mm. long. Batavia, 1; Pelaboean Ratoe, 1.

TETRAODON LUNARIS⁶ Bloch and Schneider.

Three specimens, 70, 70, and 95 mm. long. Batavia.

LEIODON PATOCA⁷ (Hamilton-Buchanan).

Ten specimens, 40 to 60 mm. long. Wynkoop's Bay, Pelaboean Ratoe.

Native name "Wun-tuk."

CRATYRACION FLUVIATILIS⁸ (Hamilton-Buchanan).

Six specimens, 80 to 100 mm. long. Welcome Bay, Bantam.

FRAGMENTS OF SHARKS, RAYS, ETC.

Trygon, perhaps *T. uarnak*; parts of head and back of two large specimens.

Dasyatis or *Rhinobatus*; jaws of large specimen.

Sphyrna, two heads with the lateral projections removed. Perhaps *S. zygaena* and *S. blochii* as the mouth appears to be of different shape in the two.

¹ Bleeker (*Brachirus zebra*), Atlas Ichth., vol. 6, p. 22, pl. 240, fig. 3.

² Idem, vol. 5, p. 91, pl. 231, fig. 3.

³ Idem, vol. 5, p. 89, pl. 217, fig. 1.

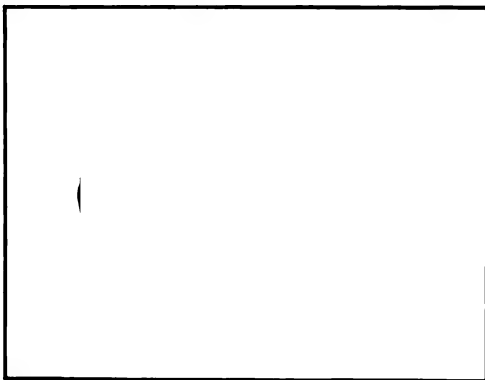
⁴ Idem, vol. 5, p. 92, adult figured pl. 217, fig. 3.

⁵ Idem, vol. 5, p. 62, pl. 207, fig. 4.

⁶ Idem, vol. 5, p. 63, pl. 206, fig. 2.

⁷ Idem, vol. 5, p. 76, pl. 210, fig. 2.

⁸ Idem, vol. 5, p. 68, pl. 210, fig. 4.



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2

VIEWS OF SCALES OF (1) *ALOSA KANAGURTA* AND (2) *ALOSA SAPIDISSIMA*

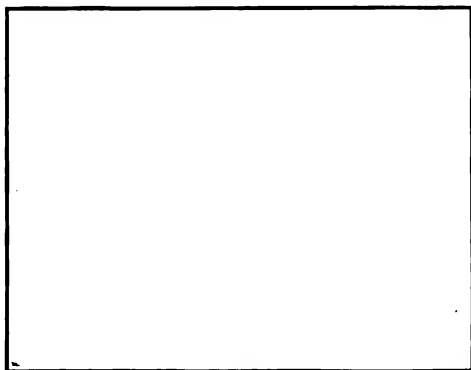
FOR REFERENCE TO PLATE SEE PAGE 590.

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2

VIEWS OF SCALES OF (1) *POMOLOBUS PSEUDOHARENGUS* AND (2) *ALOSA SAPIDISSIMA*,
FEMALE.

FOR REFERENCE TO PLATE SEE PAGE 590.



1

2

3

VIEWS OF SCALES OF (1) HARENGULA PERFORATA, (2) BREVOORTIA
TYRANNUS, AND (3) ILISHA INDICA.

FOR REFERENCE TO PLATE SEE PAGES 590 AND 591.

CONTRIBUTIONS TO OUR KNOWLEDGE OF BEES AND
ICHNEUMON-FLIES, INCLUDING THE DESCRIPTIONS OF
TWENTY-ONE NEW GENERA AND FIFTY-SEVEN NEW
SPECIES OF ICHNEUMON-FLIES.

By H. L. VIERECK,

Of the Bureau of Entomology, United States Department of Agriculture.

The present paper is the result of recent investigations conducted chiefly to ascertain the names of economic species to be used in forthcoming papers on their biology.

In this paper species transferred from one genus to another are given as headings in which the former genus in parentheses precedes the later genus. These species are arranged alphabetically according to the later genus, as for example (*Ephialtes*) *Callisphialtes comstocki* (Cresson), p. 633.

Superfamily APOIDEA.

Family ANDRENIDÆ.

Genus ANDRENA Fabricius.

Andrena FABRICIUS, Syst. Ent., 1775, p. 376.

Many species originally included.

Type.—*Apis helvola* Linneus, by present designation.

ANDRENA SAUNDERSI, new name.

Andrena nigriventris SAUNDERS, Trans. Ent. Soc. Lond., 1908, p. 208, not of Perez, Procès Verbaux Seances Soc. Linn. Bordeaux, vol. 57, p. 176 (p. 21 in reprint), 1902.

Named for the late Edward Saunders, of England, as a slight token of appreciation of his kindness toward his colleagues.

Superfamily ICHNEUMONOIDEA.

Family BRACONIDÆ.

APANTELES (APANTELES) ARISTOTELLÆ, new species.

Male.—Length, 2.5 mm.; head apparently wider than long, black, antennæ blackish or dark brown throughout, palpi stramineous; thorax, including tegulæ and coxæ, black or blackish, fore femora mostly blackish, pale at apex, mid and hind femora entirely blackish, fore tibiæ and tarsi rather pale, mid and hind tibiæ and tarsi mostly blackish or dark brown, the tibiæ pale basally, wings, including most

veins, mostly faintly whitish, stigma brownish; propodeum mostly almost smooth, with a complete areola and transverse striæ where the costulæ would be; abdomen black or blackish throughout, first plate apparently more than twice as long as wide at apex, narrower at apex than at base, with a median longitudinal fovea on the apical half, second plate rather smooth medially and basally, rather roughened apically and laterally, nearly twice as wide at base as long down the middle, and nearly twice as wide at apex as at base.

Type-locality.—Anglesea, New Jersey.

Type.—Cat. No. 14700, U.S.N.M.

Labeled, "reared from *Aristotelia fungivorella*, July 5, and collected June 13. Kearfott No. 240."

APANTELES (APANTELES) BRAUNÆ, new species.

Male.—Length, 1.5 mm.; agrees with the original description of *Apanteles prodeniæ* Viereck, except in the hind tibiæ being infuscated except at base, in the tegulæ being stramineous, in the scutel being polished, in the poorly areolated propodeum with its areola not circumscribed and apparently confluent with the basal area and basal lateral areas, costulæ developed but not trenchant, in the first abdominal plate being at least twice as long as wide at apex and mostly roughened, in the second plate being a little narrower at base than long down the middle, straight and nearly twice as wide at apex as at base, and roughened shining.

Type-locality.—United States of America.

Type.—Cat. No. 14701, U.S.N.M.

The type came from Miss Braun through W. D. Kearfott, under Kearfott No. 12.

APANTELES (APANTELES) EPINOTIÆ, new species.

Male.—Length, 2 mm.; agrees with the original description of *Apanteles prodeniæ* Viereck, except in the legs being mostly black or blackish, hind tibiæ blackish except at base, hind tarsi stramineous beneath, brownish above, in the scutel being polished and virtually impunctate; propodeum with only the lower half of the areola defined by carinæ, other carinæ entirely wanting or poorly suggested; first abdominal plate at least twice as long as wide at apex, apparently a little narrower at apex than at base, mostly roughened and with a median longitudinal fovea; second plate smooth and shining and at least twice as wide at base as long down the middle; wings whitish, including the veins and stigma excepting the costa and bounding veins of the stigma, which are rather stramineous.

Type-locality.—Anglesea, New Jersey.

Type.—Cat. No. 14702, U.S.N.M.

Labeled, "collected June 15 and reared June 29 from *Epinotia saliciana*, W. D. Kearfott, Kearfott No. 247."

APANTELES (APANTELES) GELECHIE, new species.

Female.—Length, 2.5 mm.; agrees with the original description of *A. fumiferanæ* Viereck, to which it is related, except in the rather oblique, curved sides of the second plate, which are apparently as long as the plate is long down the middle, in the black femora the anterior pair of which is mostly stramineous on its apical half, in the hind tibiæ, which are mostly blackish on the apical half and mostly reddish on the basal half, with the extreme base rather stramineous and in the exerted portion of the ovipositor, which is at least as long as the abdomen.

Type-locality.—East River, Connecticut.

Type.—Cat. No. 14703, U.S.N.M.

Labeled, "reared from *Gelechia trialbamaculella*, August, 1910, Dr. Chas. R. Ely, No. 156."

APANTELES (APANTELES) LITHOCOLLETIDIS, new species.

Male.—Length, 1.5 mm.; compared with the original description of *A. aristotelæ* Viereck, this differs as follows: Palpi dark; wings, including stigma and veins brownish; propodeum without an areola, the latter barely suggested at apex by faint striæ, otherwise almost sculptureless; first plate distinctly more than twice as long as wide at apex and at least twice as long as wide at base, without a median fovea; second plate more or less finely sculptured throughout, nearly twice as long down the middle as wide at base and at least twice as wide at apex as at base, its apex straight and its sides arcuate.

Type-locality.—Warren, Massachusetts.

Type.—Cat. No. 14704, U.S.N.M.

Labeled, "reared from *Lithocolletes* on sweet fern, W. D. Kearfott."

APANTELES (APANTELES) PLESIUS, new species.

Female.—Length, 3.5 mm.; related to *Apanteles* (*Apanteles*) *edwardsii* Riley from which it can be distinguished by the second plate being more nearly three than four times as wide at apex as long down the middle, by the third segment being regulose to beyond the middle, by the first plate being apparently wider at apex than at base, and by the hind femora being reddish with the apical third more or less blackish. As in *A. edwardsii* Riley the head is not longer than wide, the thorax not depressed, the tegulæ stramineous, and all coxæ more or less black.

Type-locality.—Essex County, New Jersey.

Type.—Cat. No. 14705, U.S.N.M.

Labeled, "from larva on white oak, June 29, Kearfott No. 223."

APANTELES (APANTELES) POLYCHROSIDIS, new species.

Female.—Length, 2.5 mm.; closely related to *A. edwardsii* Riley from which it can be distinguished by the finely sculptured propodeum

which is partly polished and by the hind femora in the female being reddish with the apical third more or less brownish or dark. Stigma and its boundaries stramineous.

Type-locality.—Washington, District of Columbia.

Type.—Cat. No. 14706, U.S.N.M.

Allotype.—With the first segment apparently a little narrower at apex than at base, second plate approximately as long down the middle as wide at base and apparently two and one-half times as wide at apex as at base; antennæ a little longer than the body; hind femora blackish throughout, hind tibiæ blackish except at base, where they are stramineous. Otherwise essentially as in the female.

Labeled, "from *Polychrosis liriodendrana*, August 1, Kearfott No. 672. Reared by W. D. Kearfott."

APANTELES (APANTELES) TRACHYNOTUS, new species.

Male.—Length 3.5 mm.; head apparently wider than long, including the antennæ, mandibles and labrum black, palpi mostly pale, antennæ longer than the body; thorax not depressed, including the tubercles, black; wings with a brownish tinge, stigma and costæ blackish, radius, transverse cubitus, third abscissa of cubitus, second abscissa of media, nervulus and first abscissa of discoidal vein brownish, rest of veins stramineous; dorsulum dull with adjoining or almost adjoining punctures, scutellum shining, not so closely and more distinctly punctured than the dorsulum; coxæ and femora, except fore femora, mostly black, fore femora black basally, apically reddish, tibiæ mostly reddish, tarsi mostly blackish; propodeum coarsely rugose, with costulæ, with the areola, basal area, and other areas before the costulæ more or less confluent; abdomen mostly black or blackish, first plate at least twice as long as wide at base, nearly parallel sided but somewhat narrower at apex than at base, its apical three-fourths rugose; second plate rugulose, rather striate apically, about one and one-half times as wide at base as long down the middle, its apical edge which is straight approximately twice as wide as the basal edge, its sides diverging on the basal half, parallel on the apical half; remaining segments smooth, indistinctly punctured, the third segment at least one and one-half times as long as the second.

Type-locality.—Little Silver, New Jersey.

Type.—Cat. No. 14707, U.S.N.M.

Labeled, "bred June 13 from *Pegomyia vicina* Lintner infesting *Chenopodium*" on authority of Prof. John B. Smith.

Paratypes from New Haven, Connecticut, May 26, 1904 (H. L. Viereck); July 20, 1904, and July 19, 1905 (B. H. Walden).

Colebrook, Connecticut, July 21, 1905, on flowers of *Cicuta maculata* (H. L. Viereck); West Haven, Connecticut, June 27, 1905 (H. L. Viereck).

ASCOGASTER OLETHREUTI, new species.

Female.—Length, 4.5 mm.; related to (*Chelonus*) *Ascogaster carpocapsæ* Viereck from which it may be distinguished by the black mandibles; the more pointed clypeus; by the antennæ being black or blackish throughout; by the acute lateral projections of the propodeum, by the intermediate projections being reduced to a carina and by the uniformly black or blackish legs, excepting apex of fore femora and all of fore tibiæ, which are more or less dark stramineous; carapace, as in *Ascogaster carpocapsæ*, nearly twice as long as wide in the middle.

Type-locality.—Pullman, Washington.

Type.—Cat. No. 14708, U.S.N.M.

The allotype is from the same locality and essentially the same as the type. The type was reared May 11, 1910, the allotype June 22, 1910, and the two male paratopotypes June 11, 1910, and May 11, 1910. All of the preceding specimens were labeled, "reared from *Olethreutes rubipunctarea* under temporary Webster No. H. 139," Bureau of Entomology, U. S. Department of Agriculture. One female paratype No. 31 bears a label indicating that it is from Colorado and referable to the Baker note No. 633.

ATANYCOLIDEA, new genus.

Related to *Atanycolus* Foerster from which it differs chiefly in having a thorax as in *Platybracon* Szepligeti.

Type.—*Bracon rugosiventris* Ashmead.

CANTHAROCTONUS, new genus.

Related to *Spathius* Nees from which it differs chiefly in the non-cubical head, the temples not nearly produced as far as the outside line of the eyes, in the well-defined notauli, in the recurrent vein being received by the first submarginal cell, in the nonangulate hind coxæ and in the abdomen being poorly chitinized beyond the first segment.

Type.—*Cantharoctonus stramineus*, new species.

CANTHAROCTONUS STRAMINEUS, new species.

Female.—Length, 2.25 mm.; stramineous; head and thorax mostly polished; head darker than thorax; face, including clypeus and mandibles, mostly yellowish; front and vertex almost bare, with a few whitish hairs; ocelli almost equidistant and inclosing a triangular blackish area, the hind ocelli nearer to each other than to the eye margin; flagel 24-jointed, all joints at least twice as long as thick; wings almost colorless, except for the veins which are infuscated and the stigma which is pale stramineous; coxæ, trochanters and base of

femora rather whitish, rest of legs rather pale whitish stramineous; propodeum finely sculptured, with the third lateral area and with a petiolarea from which latter a median longitudinal carina extends to the base of the propodeum; first dorsal segment finely sculptured, nearly parallel sided, apparently at least three times as long as wide at base; second dorsal segment laterally chitinized like the first, rest of abdomen rather membranous, much paler than the first segment; ovipositor hardly exerted.

Type-locality.—Department of Piura, Peru.

Type.—Cat. No. 14709, U.S.N.M.

Reared by Mr. C. H. T. Townsend, who writes that this species is evidently from the square-weevil, *Anthonomus vestitus*.

CHELONUS (CHELONELLA) BUSCKI, new species.

Female.—Length, 3.5 mm.; mandibles blackish at base, dark stramineous tipped with castaneous, scape dark stramineous; pedicel more or less concolorous with the scape; flagel 14-jointed, all joints distinctly longer than wide, the first joint largely brownish stramineous, the remaining joints dark brownish to black or blackish; fore and mid coxæ and trochanters mostly stramineous, rest of fore legs dark stramineous, with the tarsi more or less dark brown, rest of mid legs mostly blackish; hind coxæ black, their trochanters with the proximal joint stramineous, their distal joint stramineous beneath, brownish above; hind femora black, hind tibiæ with the basal fifth blackish, as are the apical three-fifths, the remaining fifth whitish, spurs yellowish, tarsi dark brown; basal half of wings with the membranous portion mostly colorless, the membranous portion of the apical half brownish, veins brownish except the costa and media, which are whitish at base, the submedia, somewhat more than the basal half of which is whitish and the apices of which are pale yellowish or whitish, stigma blackish, tegulæ black; propodeum with its apical transverse carina slightly quadrangulate; basal fifth of carapace with a median longitudinal carina in addition to the lateral carinæ, the second fifth mostly stramineous with a brownish band down the middle, remainder of the carapace black.

Type-locality.—Montserrat, Trinidad.

Type.—Cat. No. 14710, U.S.N.M.

Judging from one paratopotype, this is a fairly constant species. The above-mentioned specimens were collected by Mr. August Busck, June 29, 1905.

Named for Mr. August Busck.

CHELONUS (CHELONELLA) RUFICOLLIS, new species.

Female.—Length, 3.5 mm.; head typical, black and sculptured, the malor space not separated from the face by a difference in sculp-

ture but confluent in every way; mandibles mostly stramineous, blackish at base, castaneous at apex; scape stramineous tinged with brown, rest of antennæ dark brown to blackish; flagel 14-jointed, most of the joints distinctly longer than thick, the tenth and eleventh apparently thicker than long; palpi pale; most of pronotum, all of mesonotum, and most of mesopleuræ rather reddish stramineous; rest of thorax mostly black; tegulæ including the veins rather stramineous, the rest of the fore wings brownish, with brownish veins and blackish stigma; fore legs mostly stramineous, mid legs similarly colored to the fore legs but with their femora tinged with brown, hind legs with their coxæ brownish, their trochanters yellowish, their femora mostly dark brownish, their tibiæ with the apical half mostly dark brown, the rest yellowish except for a sub-basal brownish macula, their tarsi mostly yellowish except the apical joint, which is dark brown; propodeum black with its apical carina quadrangular, the lateral processes not prominent; carapace black, with a dotlike area just below the apex.

Type-locality.—Pernambuco, Bonito Province, Brazil.

Type.—Cat. No. 14713, U.S.N.M.

Allotopotype.—Essentially as in the type except the flagel, which is 18-jointed, with all the joints longer than thick; thorax black except the mesonotum, which is reddish anteriorly and laterally on the anterior half; carapace with a transversely oval foramen at apex.

Labeled, No. 576. A. Koebele, February, 1883.

CHELONUS (CHELONELLA) TOWNSENDI, new species.

Female.—Length, 2.5 mm.; black and shining; sides of the front with arcuate striæ, the striated portion bounded above by a carina; a well-marked furrow between the upper edge of the clypeus and the face; front with a prominent almost carina like, longitudinal, median welt extending upward from a little below a point on a line with the lower edge of the antennal scrobes; scape castaneous, nearly as long as the first and second flagellar joints combined; pedical brownish; flagel 14-jointed, first five joints mostly brownish, the remaining joints blackish to black, all joints longer than thick; tegulæ rather stramineous; forewings brownish, with blackish veins, stigma and parastigma, the basal third of the forewings, however, are rather yellowish or stramineous with the veins of the same portion stramineous; legs and apical foramen of the carapace essentially as in *Chelonus szepligetii* Viereck; carapace rather cylindrical.

Type-locality.—Department of Piura, Peru.

Type.—Cat. No. 14714, U.S.N.M.

Collected by C. H. T. Townsend and labeled, No. 795³q.

Named for Mr. C. H. T. Townsend.

CHELONUS (CHELONUS) CHILENSIS, new species.

Male.—Length, 5 mm.; agrees with the original description of *Chelonus bipunctulatus* Viereck, except in the apical edge of the clypeus which is truncate, in the first joint of the flagel, being apparently as long as the scape, and in the carapace, which is black throughout.

Type-locality.—Chile.

Type.—Cat. No. 14711, U.S.N.M.

Presumably collected by E. C. Reed. This may prove to be the male of *Chelonus bipunctulatus* Viereck.

CHELONUS (CHELONUS) GOSSYPIL, new species.

Female.—Length, 2.5 mm.; otherwise agrees with the original description of *Chelonus buscki* Viereck except as follows: Mandibles pale stramineous between base and apex; scape and pedicel pale, stramineous; flagel 23-jointed, the seventh to twelfth joints apparently a little thicker than long, the first joint yellowish, the remaining joints more or less brownish; all coxæ rather castaneous, mid femora stramineous tinged with castaneous, mid tibiæ and tarsi more or less brownish; hind trochanters mostly stramineous, hind femora castaneous, hind tibiæ mostly brownish, yellowish at extreme base, hind spurs pale, hind tarsi brownish; wings uniformly almost colorless, tinged with brown, tegulæ rather castaneous, veins almost concolorous, brownish, media pale at base, stigma brownish; carapace blackish throughout, without a median longitudinal carina.

Type-locality.—Pernambuco, Bonito Province, Brazil.

Type.—Cat. No. 14712, U.S.N.M.

Allotopotype.—Essentially as in the type but with the seventh to twelfth joints of the flagel distinctly longer than thick.

Labeled, "No. 285, on cotton worm, February 11, 1883."

CHELONUS SZEPLIGETII, new name.

Chelonus sobrinus SZEPLIGETI, Ann. Hist. Nat. Mus. Nat. Hung., vol. 2, p. 194, 1904, not of Haldeman, Proc. Acad. Nat. Sci. Phila., vol. 4, p. 203, 1849.

CYANOPTERUS DEPRESSI, new species.

Female.—Length, 13 mm.; judging from the original description of *Ipobracon persimilis* Szepligeti this would appear to be a closely related species; *C. depressi* can be distinguished from the former by the head, thorax, abdomen, antennæ, and legs being black throughout except the first four dorsal segments which are reddish black.

Type-locality.—Port of Spain, Trinidad.

Type.—Cat. No. 14715, U.S.N.M.

Labeled, "from larva of *Steirastoma depressum*, P. L. Guppy, Coll. No. 77."

CYANOPTERUS PECULIARIS, new species.

Female.—Length, 12.5 mm.; apparently agrees best with *Ipobracon bonaerensis* (Schroetky) as originally described, but differs especially as follows: Cheeks reddish; antennæ distinctly shorter than the body, thorax rather castaneous; fore coxæ and trochanters concolorous with the femora; mid-coxæ and femora blackish brown, their trochanters rather testaceous; hind legs blackish throughout excepting base of tibiæ and the trochanters which are pale; wings almost uniformly dark brown; the radial cell at base and along the lower edge, first cubital cell and base of third discoidal cell, yellowish; first discoidal cell rather blackish, second transverse cubitus bisinuate; propodeum without furrows; abdomen uniformly dark reddish; second dorsal segment mostly smooth, laterally elevated along the margins, medially rather triangularly, intumescent, the swollen median area at base on each side with a sharp edge; third dorsal segment with the anterior, lateral areæ barely indicated; ovipositor 12 mm. long.

Type-locality.—San Bernardino, Paraguay.

Type.—Cat. No. 14716, U.S.N.M.

Labeled, "No. 814, K. Fiebrig, collector, October 20."

CYANOPTERUS STEIRASTOMÆ, new species.

Female.—Length, 11 mm.; appears to have characters in common with those mentioned in the original description of *Bracon nigripes* Brulle, from which it may be distinguished by not having the pale portions of thorax and abdomen concolorous, the former being reddish and the latter yellowish, and the proportionally shorter ovipositor; differs from *Ipobracon grandiceps* Szepligeti, with the original description of which it agrees, except in the first abscissa of the cubitus not being broken, in the pronotum being reddish and in the pale portion of the abdomen being yellowish. Ovipositor 7 mm. long.

Type-locality.—Port of Spain, Trinidad.

Type.—Cat. No. 14717, U.S.N.M.

Allotopotype.—Essentially as in the type except in the attenuated portion of the median area of second segment which is more carinate than in the type.

Labeled, "from larva of *Steirastoma depressum*, P. L. Guppy, collector; No. 76."

DIGONOGASTRA, new genus.

This name is proposed for a group of species having characters in common with *Cyanopterus* Haliday but with an area or keel on the third dorsal segment.

Type.—*Bracon epicus* Cresson.

EURADIZON LITHOCOLLETIDIS, new species.

Female.—Length, 2 mm.; mostly stramineous and finely sculptured; face rather yellowish; interocellar space blackish; mesopleuræ without a furrow, finely sculptured; propodeum delicately sculptured, virtually without carinæ, blackish at apex; cubital vein with only two abscissæ; dorsal abdominal segments rather granular excepting third and fourth segments apically and most of remaining segments which are polished; onychii blackish; exerted portion of ovipositor at least three-fifths as long as the abdomen.

Type-locality.—Auburndale, Massachusetts.

Type.—Cat. No. 14718, U.S.N.M.

Labeled, "bred from leaves of the swamp whiteoak mined by *Lithocolletes hamadryadella* Clemens, July 25, 1911."

Received from Mr. C. W. Johnson.

EUTRICHOPSIS AGROMYZÆ, new species.

Female.—Length, 1.25 mm.; mostly black and polished; clypeus yellowish, its anterior edge arcuated so as to form a transversely elliptical opening with the mandibles when the latter are in the flexed position; mandibles mostly yellowish, with brownish to blackish tips; other mouth parts rather whitish yellow; scape and pedicel rather brownish; flagel 17-jointed, brown, all the joints at least twice as long as thick; mesopleuræ with an oblique, foveolate furrow extending downward and backward; tegulæ brownish, wing base rather stramineous; legs mostly yellowish excepting hind tibiæ and tarsi which are mostly fuscous; wings with a brownish tinge; propodeum mostly indefinitely sculptured; first dorsal segment distinctly longer than wide at apex, rather reticulated and yellowish; second segment smooth and yellow, approximately as long as wide at base and nearly twice as wide at apex as at base; ovipositor hardly exerted.

Type-locality.—Lafayette, Indiana.

Type.—Cat. No. 14719, U.S.N.M.

Labeled, "Webster No. 6395, August 7, 1911, P. Luginbill collector, reared from *Agromyza*."

Allotopotype.—Essentially as in the type, but scape and pedicel rather stramineous; flagel 19-jointed.

Data as in the type.

HABROBRACON JOHANNSENI, new species.

Female.—Length, 2 mm.; related to *Habrobracon stabilis* Wesmæel from which it may be distinguished by the 22-jointed antennæ, in the almost entirely blackish head, the yellow border along the eye being greatly reduced; legs mostly blackish, the hind tibiæ pale at base, and beneath on the basal half; abdomen mostly black or blackish except the ventral fold which is stramineous.

Type-locality.—Orono, Maine.

Type.—Cat. No. 14720, U.S.N.M.

A paratopotype has the antennæ 21-jointed.

This is the species referred to as *Bracon* sp.¹

HABROBRACON TETRALOPHÆ, new species.

Female.—Length, 2 mm.; antennæ 23-jointed; related to *H. johannseni* Viereck from which it can be distinguished by the stramineous hind femora.

Type-locality.—Lafayette, Indiana.

Type.—Cat. No. 14720, U.S.N.M.

Female paratopotype.—Essentially as in the type, the abdomen mostly black. Labeled, "Webster No. 6344, issued September 19, 1911, P. Luginbill, collector."

HELCON CASTANÆÆ, new species.

Female.—Length, 8.5 mm.; related to *H. dentipes* Brulle from which it can be distinguished by the black antennæ, thorax, propodeum and fourth and following abdominal segments, and in the almost impunctate second dorsal segment.

Type-locality.—Tryon, North Carolina.

Type.—Cat. No. 14722, U.S.N.M.

Allotype characters essentially as in the type. Specimens examined are from the type-locality and labeled, "*Castanea dentata*, W. F. Fiske, collector, with the following Hopk. U. S. numbers: 3015*h.*, 3075*g.*, 3055*g.*, 3014*b.*, 3033*j.*, and 1407*b.*"

The pupa case is translucent testaceous, 11 mm. long, nearly three times as long as wide in the middle, and membranous with some free strands of silk.

MACROCENTRUS CERASIVORANÆ, new species.

Female.—Length, 8 mm.; mostly uniformly reddish; ocellar region blackish; antennæ mostly brownish, becoming blackish toward the end, flagel 51-jointed; third joint of the maxillary palpi somewhat shorter than the first joint of the flagel but more than half the length of that joint; palpi, mouth and clypeus rather stramineous; head a little wider than long; tegulæ stramineous; wings almost colorless, with a brownish cast, stigma brownish stramineous, veins brownish; nervulus virtually interstitial or a little beyond the basal vein; legs mostly reddish, the trochanters rather stramineous; abdomen shining, with minute setigerous punctures; the first, second, and third segments striate, the first segment rather sculptureless down the middle on the basal half, the second depressed along the lateral margin, the depression rather clavate in outline, the apical third

¹ Bull. No. 195, Maine Agr. Exp. Station, Orono, Maine.

of the segment smooth and without striæ; exerted portion of the ovipositor 9 mm. long.

Type-locality.—Ithaca, New York.

Type.—Cat. No. 14723, U.S.N.M.

Allotype.—Essentially as in the type.

Labeled, "reared June, 1911, from *Archips cerasivorana*, Glenn W. Herrick." A female paratype studied is labeled, "Pullman, Washington, No. 6618°, on *Cacoecia cerasivorana*, C. V. Piper, collector."

METEORUS NIPPONENSIS, new species.

Female.—Length, 4.5 mm. long; related to *M. pulchricornis* Wesmael in structure but with the fossæ of the petiole so inconspicuous as to be easily taken for the starting points of striæ unless magnified 35 times, also the recurrent vein is clearly received by the first cubital cell; color very as in *M. japonicus* Ashmead.

Type-locality.—Japan.

Type.—Cat. No. 13082, U.S.N.M.

Labeled, "Gip. Moth Lab. No. 1075, Jn. 30."

MICROBRACON VESTITICIDA, new species.

Female.—Length, 3 mm.; judging from descriptions this is related to *Bracon bimaculatus* Szepligeti and *B. binotatus* Szepligeti; from the former it may be known, by the smooth not wrinkled face, by the subcylindrical scape, by a suggestion of parapsidal furrows, by the cubital vein being straight at base, by the rather oval abdomen, by the reddish head and thorax with black stains and black mesosternum, by the yellowish metathorax and blackish propodeum, by the more or less stramineous legs excepting the hind tibiæ and tarsi which are mostly infuscated, the basal fourth of the hind tibiæ being pale, rather whitish stramineous, by the mostly yellowish abdomen with a blackish or dark stain down the middle on the apical half and in the ovipositor which is not much longer than the abdomen, resembling in this particular the latter species to which it seems to be related. Wings brownish; flagel 25-jointed; median carina of propodeum not reaching up to the middle but prolonged almost to the base as a median welt; second segment with an acutely triangular median intumescence, the apex of which is prolonged as a median welt almost to the apex of the segment.

Type-locality.—Department of Piura, Peru.

Type.—Cat. No. 14724, U.S.N.M.

Allotopotype.—Antennæ 24-jointed; essentially as in the type.

Labeled, "reared from *Anthonomus vestitus*, dept. Piura, Peru, July, 1911, C. H. T. Townsend, No. 795°3i; from infested squares and new bolls, dept. Piura, Peru, No. 795; and from square-weevil larvæ north Peru, October 23, 1910, No. 795°3a."

A series of paratopotypes shows this to be a variable species in color and size, ranging paler or darker than the type and smaller; structurally, however, it is quite fixed. The paratypes from north Peru average somewhat larger than the type and are better developed, with the intumescence ending in a carina and with the false suture distinctly foveolate.

MONOGONOASTRA, new genus.

Proposed to cover a group of species distinguishable from *Campyloneurus* Szepligeti by the absence of a median area or carina on the third dorsal abdominal segment.

Type.—*Bracon atripectus* Ashmead.

PERILITUS EPITRICIS, new species.

Female.—Length, 1.5 mm.; labial palpi apparently two-jointed; stramineous, smooth and polished, black around the ocelli, mandibles with castaneous tips, flagel mostly brownish, 18-jointed, the joints longer than thick; notauli rather foveolate and meeting at the hind margin of the mesonotum which is somewhat brownish; venation virtually as in *Perilitus mellinus* Provancher, the membrane practically colorless, veins and stigma brownish stramineous; legs rather uniformly stramineous, except the apical joint of the tarsi which is rather brownish; propodeum impressed posteriorly, poorly reticulated; petiole well differentiated, smooth, almost parallel sided, post-petiole, longitudinally striated, a little shorter than the petiole, wider at apex than at base and longer than wide at apex; first segment a little longer than half of the rest of the abdomen, sheaths of the ovipositor at least as long as the first segment.

Type-locality.—Clarksville, Tennessee.

Type.—Cat. No. 14725, U.S.N.M.

Allotopotype.—Differs from the type chiefly in the 21-jointed flagel, blackish front, vertex, and dorsum of apical third of abdomen, rest of head, thorax, and propodeum rather castaneous.

The type is labeled "reared May 28, 1911, the allotopotype June 9, 1911, and two female paratopotypes May 25, 30, 1911, from adults of *Epitrix paroula*, S. E. Crumb." The cocoon is pure white and wooly.

APANTELES (PROTAPANTELES) FELTLE, new species.

Female.—Length, 2.5 mm.; related to *Apanteles* (*Protapanteles*) *cassianus* Riley from which it differs in the shining face, in the wings being colorless with stramineous veins between the base of wing and base of stigma, and with brownish tinge and brownish veins beyond, in the blackish stigma, in the black tegulae, and blackish wing base; in the first segment being truncate and indistinctly sculptured at apex, in the second plate being nearly as wide at base as long down

the middle, and in the hind tibiæ being almost entirely testaceous. As in *A. cassianus* Riley the facial line is apparently shorter than the transfacial line, the first dorsal plate is distinctly narrower at apex than at base and less than twice as long as wide at base; the first and second plates are mostly smooth; the propodeum smooth and without a median longitudinal carina and the hind coxæ and their femora black.

Type-locality.—Knox, Indiana.

Type.—Cat. No. 14726, U.S.N.M.

Labeled, "bred from *Feltia* sp. June 4, 1911, M. M. High, Chittenden No. 1850," Bureau of Entomology, United States Department of Agriculture.

APANTELES (PROTAPANTELES) HESPERIDIVORUS, new species.

Female.—Length, 1.75 mm.; related to *Apanteles* (*Protapanteles*) *crambi* Weed, with which it agrees in the head being apparently wider than long, in the vertical diameter of the thorax being apparently equal to the horizontal diameter, in the absence of a carinate fold between mesopleuræ and mesosternum, in the first plate being wider at apex than at base and wider at apex than the second plate is long down the middle, in the third dorsal segment being virtually sculptureless at base, in the stramineous or at least pale, tegulæ, in the hind coxæ being mostly black or blackish tipped with stramineous, and in the second plate being sculptured all over. It differs most tangibly in the uniformly dark brown to blackish antennæ, in the almost impunctate, polished scutel, in the black or blackish dorsal segments of the abdomen, and the presence of a median welt on the second plate.

Type-locality.—East River, Connecticut.

Type.—Cat. No. 14727, U.S.N.M.

The specimens examined are labeled, "reared from a skipper larva on oak, August 5, 1910, Chas. R. Ely."

The characters in the male paratopotype are essentially as in the female.

The cocoons are white, covered with loose silk and loosely grouped.

APANTELES (PROTAPANTELES) PYRAUSTÆ, new species.

Female.—Length, 2.5 mm.; head apparently wider than long, flagel wholly dark brown, and in this respect agreeing with *Apanteles* (*Protapanteles*) *læviceps* Ashmead, from which it may be distinguished by the second plate not being sculptured throughout but partly smooth and mostly shining; thorax not depressed, hind femora mostly stramineous, with blackish tips; second plate without deep foveolate oblique furrows on basal half. In *P. læviceps* Ashmead, as in this species, the first plate is wider at apex than the second plate is long down the middle; the pleuræ are not separated from the

mesosternum by a carinate fold; the third dorsal segment is perfectly smooth at base, and the tegulæ are dark brownish or blackish.

Type-locality.—East River, Connecticut.

Type.—Cat. No. 14728, U.S.N.M.

Labeled, "reared August 7, 1909, from *Pyrausta futilalis*, Chas. R. Ely, No. 113."

The allotype agrees fairly well with the description of the type.

APANTELES (PSEUDAPANTELES) CHOREUTI, new species.

Female.—Length, 2.5 mm.; related to *Pseudapanteles etiellæ* Viereck from which it differs in the yellowish scape; in the legs including coxæ being stramineous, except for the hind tibiæ, which are reddish and the hind tarsi which are brownish; in the brownish wings with darker, brownish stigma and veins, with the radius about half as long as the transverse cubitus; in the rather reticulately rugose propodeum; in the rugulose first dorsal plate which is apparently a little narrower at apex than at base; at least twice as long as wide at base, and apparently wider in the middle than at base or apex; second plate a little shorter down the middle than the first plate is wide at apex, nearly four times as wide at apex as long down the middle, rather spindle shaped, and longitudinally striate; third, dorsal segment dullish and brownish except for a yellowish spot on each side and a little longer than the second plate; first, second, and most of third ventral segments as well as the prominent hypopygium more or less stramineous.

Type-locality.—Anglesea, New Jersey.

Type.—Cat. No. 14729, U.S.N.M.

The allotype agrees fairly well with the type except in the second plate which is about as long as the first is wide at apex, trapezoidal not spindle shaped and about three times as wide along its straight apical edge as long down the middle; in the apex of the first plate being distinctly narrower than the base and in the hypopygium being dark brown to blackish while the rest of the venter is mostly stramineous.

Both specimens are labeled, "reared in July from *Choreutis cardinella*, W. D. Kearfoot, No. 60."

SPATHIUS BRUNNERI, new species.

Female.—Length, 2.75 mm.; superficially similar to *Spathius unifasciatus* Ashmead from which it may readily be distinguished by the better impressed sternali which are not bounded below by a carina; prothorax blackish throughout; first dorsal segment apically and disk of second dorsal segment mostly reddish brown; pale portions of legs mostly rather stramineous, the tarsi rather reddish stramineous, except tip of onychium, claws and empodium which are

blackish, annulus at base of tibiæ almost colorless, rather smoky whitish; flagel 24-jointed, first and second joints pale and almost concolorous with the testaceous scape and pedicel; face and mandibles mostly brownish; ovipositor somewhat longer than the abdomen; otherwise agreeing essentially with the original description of *Spathius unifasciatus* Ashmead.

Type-locality.—Columbia Falls, Montana.

Type.—Cat. No. 14730, U.S.N.M.

Labeled, "No. 8574 Hopk. U. S., from *Pissodes* species, Josef Brunner, collector."

Named for Mr. Josef Brunner.

Genus TRIASPIS, Haliday.

Triaspis HALIDAY, Ent. Mag., vol. 3, 1835, pp. 123-124.

Many species originally included.

Type.—*Sigalphus caudatus* Nees, by present designation.

This is the same as *Sigalphus* of authors not of Latreille which latter is isogenotypic with *Sphaeropyx* Illiger.

TRIASPIS PISSODIS, new species.

Female.—Length, 2 mm.; black and shining or polished; clypeus rather coarsely indefinitely punctured; mandibles reddish, blackish at base and apex; palpi blackish; antennæ blackish; flagel 18-jointed, its joints all longer than thick; tegulæ blackish; notauli foveolate; wings almost colorless, with a dark tinge; stigma and costa blackish, veins blackish stramineous; second abscissa of the cubitus nearly twice as long as the first abscissa of the radius; all coxæ black, fore and mid trochanters blackish; fore femora atramineous, with blackish stains, fore tibiæ stramineous; mid femora reddish, blackish above, mid tibiæ reddish; hind femora and tibiæ reddish, the latter blackish above; all tarsi mostly blackish; propodeum vaguely areolated; abdomen with two distinct, curved, transverse furrows dividing the dorsum into three almost equally long segments, all of which are longitudinally striated, the striæ of the third segment converging toward a median longitudinal smooth or punctured or roughened area, the third segment with its apical edge reflexed so as to form an apical bounding channel to the segment; exerted portion of ovipositor approximately two-thirds as long as the abdomen.

Type-locality.—Columbia Falls, Montana.

Type.—Cat. No. 14731, U.S.N.M.

Allotype.—Essentially as in the type even to the number of joints in the flagel.

The specimens are labeled, "No. 8573, Hopk. U. S., ex *Pissodes* species, bred specimens, June 1-7, 1911, Josef Brunner, collector."

TRIASPIS VESTITICIDA, new species.

Female.—Length, 2 mm.; black, clypeus rather coarsely but indefinitely sculptured; mandibles testaceous, tipped with castaneous; scape somewhat darker than the mandibles but similarly colored; pedicel brownish, flagel with its first three joints mostly brownish the remaining joints black or blackish, the joints near the apex almost as short as thick; tegulæ blackish; basal two-thirds of the costa yellowish, rest of costa brownish as is the stigma, remaining veins pale stramineous, almost colorless; second abscissa of the bubitis virtually as long as the first abscissa of the radius; legs, including fore coxæ mostly stramineous, mid and hind coxæ mostly brownish; propodeum mostly smooth and almost polished, the dorsal aspect separated from the posterior aspect by a transverse angulated carina; posterior aspect more or less divided into areolæ by oblique carinæ; anterior aspect of first segment with a prominent, rather transverse carina on each side between the anterior aspect and the rest of the segment, the same carina being continued down the segment to the apex as one of the striæ; first and second segments striate, most of the striæ extending to the apex of the segments; third striate laterally, smooth and highly polished medially; apical edge of third segment sinuate and bordered by a furrow; ovipositor prominent, the exerted portion longer than the abdomen; otherwise quite as in the genotype.

Type-locality.—Department of Piura, Peru.

Type.—Cat. No. 14732, U.S.N.M.

Allotopotype.—Differs from the type chiefly in the 18-jointed flagel which is blackish throughout; in the blackish scape and pedicel, in the joints near the apex being distinctly longer than thick; in the basal two-thirds of the costa being brownish; in the darker legs, the fore coxæ being brownish and the hind tibiæ and tarsi infuscated.

Paratopotypes show that the costa in the female may be more or less yellowish basally, that the male antennæ may be colored as in the female, and that the males may be only 1.5 mm. long.

Labeled, "reared from *Anthonomus vestitus*, October and November, 1910, June, 1911, No. 795°3b; reared from infested squares and new bolls, No. 795." All from the type locality.

TRIASPIS VESTITICIDA var. MINUTISSIMUS, new variety.

Female.—Length, 1.25 mm.; differs from *Triaspis vestitica* Viereck apparently only in the sculptureless third segment in the mostly blackish legs, and smaller average size.

Type-locality.—Department of Piura, Peru.

Type.—Cat. No. 14733, U.S.N.M.

Allotype.—Essentially as in the type.

Labeled, "reared from *Anthonomus vestitus*, July 1911, C. H. T. Townsend, No. 795°3j."

Paratopotypes labeled, "from infested squares and new bolls, C. H. T. Townsend, No. 795."

ZELOMORPHIDEA, new subgenus.

This is a subgenus of *Zelomorpha* Ashmead from which it differs chiefly in the absence of a more or less sinuous foveolate furrow on the mesopleuræ and by the second dorsal segment being longer than wide. Probably will include all South American species at present included under *Disophrys* Foerster.

Type.—*Zelomorpha* (*Zelomorphidea*) *melanota*, new species.

Female.—Length, 10 mm.; agrees with the original description of *Disophrys ophthalmica* Szepligeti in the lower half of the face including the malar space being mostly stramineous; in the dorsulum, scutal and post scutal being mostly black or blackish; in the hind wings being almost completely and uniformly brownish; in the hind femora and tibiæ being more or less reddish and in the areola receiving the costulæ before the middle.

Type-locality.—Sapucay, Paraguay.

Type.—Cat. No. 14734, U.S.N.M.

Labeled, "collected August 29, 1901."

ZAMICRODUS, new genus.

Malar line nearly two-thirds the length of the eye, malar space prolonged downward and backward into an angulate process that has its edges reflexed and its angle lower than the lower edge of the clypens, episternum of the prothorax with a tubercle on each side, pronotum produced on each side into a flattened angular crista, pronotum with its sulcus separated into four parts, each of which is bounded by strong carinæ, first dorsal abdominal segment virtually twice as long as wide at apex. Otherwise practically as in *Bassus* Fabricius as represented by (*Microdus*) *Bassus tumidulus* (Nees).

Type.—*Zamicrodus sensilis*, new species.

ZAMICRODUS SENSILIS, new species.

Male.—Length, 10.5 mm.; apparently related to *Microdus ochrosus* Szepligeti from the original description of which it differs in the fore and mid legs, excepting onychium of mid legs which is blackish, being stramineous throughout, in the hind coxæ and hind trochanters being concolorous with the thorax, in the uniformly reddish hind femora, in the basal two-thirds of hind tibiæ which is brownish, with the apical third blackish, in the mostly yellowish wings with the fourth sixth and apical sixth of the fore wings fuscous as is the apical third and a large part of the margin of the hind wings; and in the second, third,

fourth, and base of fifth segments being reddish and more or less stained with black, the first segment rather concolorous with the propodeum and the rest of the abdomen black.

Type-locality.—Manaos, Brazil.

Type.—Cat. No. 14735, U.S.N.M.

Labeled, "collected by Miss H. B. Merrill."

Family ICHNEUMONIDÆ.

Genus AMORPHOTA (Foerster) Howard.

Amorphota FOERSTER, Verh. Naturh. Ver. Preuss. Rheinland, vol. 25, 1868, p. 151, no species; Bull. No. 5, Tech. Ser. Div. Ent., U. S. Dept. Agric., 1897, p. 20, 52, fig. 7, one species.

Type.—*Amorphota orgyia* Howard, first species included.

Congeneric with *Anempheres* (Foerster) Viereck.

Genus ANEMPHERES (Foerster) Viereck.

Anempheres FOERSTER, Verh. Naturh. Ver. Preuss. Rheinland, vol. 25, 1868, p. 154, no species; Proc. U. S. Nat. Mus., vol. 39, 1911, p. 736, one species.

Type.—*Anempheres diaphaniæ* Viereck. First species included.

Congeneric with *Amorphota* (Foerster) Howard and therefore a synonym of the latter genus.

CAMPOPLEX (ANGITIA) HELLULÆ, new species.

Female.—Length, 4 mm.; related to (*Limmeria*) *Campoplex* (*Angitia*) *pterophoræ* Ashmead from which it may be distinguished by the malar line being virtually as long as the mandibles are wide at base, by the entirely blackish scape and pedicel, by all coxæ being mostly black, by the fore trochanters being stramineous, by the mid coxæ being reddish, by the areola being distinctly longer than wide, and by the third, fourth, and fifth, dorsal segments being reddish in part laterally.

Type-locality.—Santa Ana, California.

Type.—Cat. No. 14736, U.S.N.M.

Labeled, "bred from *Hellula undalis*, Nov. 10, 1908, H. O. Marsh, collector, Chittenden No. 1447^{ci}." Received from the Bureau of Entomology, U. S. Department of Agriculture.

Since describing the above the writer has received a specimen of the same species labeled, "bred from *Plutella omissa*? May 13, 1911; Chittenden No. 2184^{oo}; H. O. Marsh, collector;" Rocky Ford, Colorado. Compared with a homotype of (*Limmeria*) *Angitia obscura* (Cresson) this specimen differs in the scape being blackish beneath, in the longer malar space, which is approximately as long as the mandibles are wide at base, in the hind ocelli being apparently a little nearer to each other than to the occipital carina, in the almost vertical

nervellus, in the blackish hind tibiæ with whitish annulus at base and in the middle and in the abdomen being black or blackish above except for reddish stains on the sides of the third, fourth, and fifth segments.

ANISITSIA, new genus.

Carinal line or shortest line from hind ocelli to occipital carina approximately twice as long as the postocellar line; nervellus vertical, angulate below the middle; propodeum not attaining apex of hind coxæ but surpassing the middle of the same, its spiracles slit like; second dorsal segment shorter than the first. Related to *Amorphota* (Foerster) Howard.

Type.—*Campoplex villosus* Norton.

Named for Mr. J. D. Anisits, who discovered this genus in South America.

(CAMPOPLEX) *ANISITSIA BELLULUS* var. *n.* (Della Torre).

(ZACHERESTA) *ANISITSIA KUKAKENSIS* (Ashmead).

(CAMPOPLEX) *ANISITSIA VITICOLLIS* (Norton).

ASTERNAULAX, new genus.

Apparently related to (Gabunia) *Coccygodes* Saussure as described in Schmiedeknecht's classification in *Genera Insectorum*. Compared with the genotype of *Echthrus* Gravenhorst the principal differences are as follows: Sternauli wanting; areolet pentagonal in position, with its outer side merely represented by a streak; nervulus almost as far beyond the basal vein as the second abscissa of the discoidal vein is long, the latter distinctly shorter than the third; nervellus antifurcal, broken distinctly below the middle.

Type.—*Asternaulax fiskei*, new species.

ASTERNAULAX FISKEI, new species.

Female.—Length, 8 mm.; black; first and second joints of palpi whitish, the remaining joints dark, slaty; flagel 19-jointed, fifth, sixth, and seventh joints more or less yellowish, all joints distinctly at least twice as long as thick, the end joint truncated; fore legs stramineous, excepting the onychium which is blackish, inflated portion of fore tibiæ rather cylindrical; mid legs mostly pale, the tibiæ and tarsi more or less darkened; hind coxæ, hind trochanters, and hind femora reddish, the latter with a blackish band before the whitish apex; hind tibiæ and tarsi blackish, the former whitish at base, as are the hind metatarsi; notauli merely suggested by a slight impression and difference in sculpture; tubercles stramineous, tegulæ and wing base whitish, costa whitish basally, rest of veins brownish, stigma blackish except at extreme base where it is whitish, membranous portion of the wings with a brownish tinge, almost colorless;

propodeum rather finely reticulated, with an arcuate basal transverse carina, the basal area suggested, the second pleural area and angular area partly defined, otherwise exareolate; first segment almost as wide at apex as long down the middle, all dorsal segments but the apical dorsal segment, whitish along the apical edge; exerted portion of ovipositor hardly longer than the second segment.

Type-locality.—Tryon, North Carolina.

Type.—Cat. No. 14737, U.S.N.M.

Labeled, "No. 3033c. Hopk. U. S.; *Castanea dentata*; W. F. Fiske, collector."

Named for W. F. Fiske.

Genus *BATHYPLECTES*¹ (Foerster) Szepligetl.

For remarks on this genus, see *Paracandida*, page 642.

BENJAMINIA, new genus.

Propodeum apparently not extending to end of or beyond the basal third of the hind coxæ; hind edge of mesosternum without a process on each side of mesolcus; propodeal spiracles elongate; petiole with a furrow on each side; second abscissa of discoidal vein as long as or longer than the third, nervellus almost vertical, curved, not broken; head not lenticular, not receding vertically from the hind ocelli; distance between hind ocelli and occipital carina distinctly greater than distance between hind ocelli; areolet wanting; spiracles of first dorsal segment as near or nearer to the apex than to each other.

Type.—*Charops fuscipennis* Provancher.

Named in honor of Dr. Marcus Benjamin.

Genus *CALLIDORA* (Foerster) Thomson.

Callidora FOERSTER, Verh. Naturh. Ver. Preuss. Rheinland, vol. 25, 1868, p. 157, no species; Opusc. Ent., 1887, pt. 11, p. 1136, two species.

Type.—*Callidora annellata* Thompson, by present designation.

(EPHIALTES) *CALLIEPHIALTES COMSTOCKI* (Cresson).

CAMPOCTONUS, new genus.

Related to *Campoplegidea* Viereck, see below, from which it may be known by the interstitial nervulus, the neither broken nor angulated nervellus, by the recurrent vein being received by the areolet at or beyond the middle, by the presence of a foramin in the hind edge of the sides of the mesonotum and by the depressed second segment.

Type.—*Limneria corrupta* Cresson.

CAMPOPLEGIDEA, new genus.

Proposed for *Campoplex* Authors, not Gravenhorst.

Type.—*Campoplex oxyacanthæ* Boie.

CAMPOLETIDEA, new subgenus.

Related to *Callidora* (Foerster) Thomson from which it may be distinguished by the depressed first segment, with the apical half of the petiole distinctly wider than thick dorso-ventrally and the post petiole not bulbous. Agrees with *Campoletis* Foerster as described in the original except in the shape of the abdomen.

Type.—*Campoplex* (*Campoletidea*) *caradrinæ*, new species.

CAMPOPLEX (CAMPOLETIDEA) CARADRINÆ, new species.

Male.—Length, 8 mm; areolet quadrangular, rather rhomboidal; fore and mid femora brownish stramineous, tibiæ and tarsi of fore and mid legs mostly stramineous, tarsi of mid legs apically with a fuscous annulus, the onychium mostly fuscous, hind femora reddish with blackish stains, hind tibiæ yellowish except an incomplete brownish annulus near the base, a brown longitudinal band down the inner edge, and the apical third, which latter is mostly blackish, hind tarsi colored similarly to the middle tarsi except that the dark annulations are more extensive, involving most of the joints. Otherwise agreeing well with the original description of (*Limneria*) *Campoplex montanus* (Cresson).

Type-locality.—Rocky Ford, Colorado.

Type.—Cat. No. 14958, U.S.N.M.

Labeled, "bred from *Caradrina exigua*, June 12, 1910, H. O. Marsh, collector; Chittenden No. 1563."

Genus CAMPOLETIS (Foerster) Viereck.

Campoletis FOERSTER, Verh. Naturh. Ver. Preuss. Rheinland, vol. 25, 1868, p. 157, no species; Proc. U. S. Nat. Mus., vol. 40, 1911, p. 190, one species.

Type.—*Limnerium* (*Campoletis*) *prodeniæ* Viereck, first species included and congeneric with *Sagaritis varians* Thomson. Thus *Campoletis* (Foerster) Viereck becomes synonymous with *Sagaritis* Holmgren. In the American representatives of *Sagaritis* Holmgren the characteristic production of the clypeus is so poorly developed at times as to suggest a gradual transition to the type of clypeus found in most Campoplegini and aside from the clypeus agree best with Foerster's definition of *Campoletis*.

Genus CAMPOPLEX Gravenhorst=[OMORGUS (Foerster) Dalla Torre.]

Campoplex GRAVENHORST, Ich. Eur., vol. 3, 1829, p. 453; many species.

Type.—(*Ichneumon*) *Campoplex difformis* Gmelin, Gravenhorst, by designation of Westwood.¹

¹ Intr. Mod. Class Ins., vol. 2, Gen. Syn., 1840, p. 60.

CASINARIA SCABRIFORMIS, new species.

Female.—Length, 6 mm.; apparently related to *C. scabra* Thomson; black; scape and pedicel yellow beneath, brownish above; flagel 24-jointed, the joints as long as or longer than thick, excepting thirteenth to nineteenth joints, which are thicker than long; flagel blackish, becoming reddish brown toward the tip; labrum yellow; mandibles yellow except the castaneous tips; palpi whitish; tegulæ, wing base, fore and mid trochanters yellow; fore and mid coxæ reddish stramineous, rest of fore legs mostly yellowish or stramineous; hind coxæ blackish, proximal trochanter of hind legs brownish, distal trochanter of hind legs yellowish, hind femora reddish, hind tibiæ mostly whitish or pale yellow, infuscated near the base and at apex, the apical half reddish beneath, hind tarsi pale basally, dark apically; wings tinged with brown, costa and stigma dark brown, veins brownish stramineous; nervellus angulate far below the middle; propodeum with median and lateral carinæ, with transverse carinæ virtually wanting; second dorsal segment apically with a reddish margin, third dorsal segment with the apical half reddish, remaining dorsal segments reddish, ventral fold yellowish; sheaths blackish; ovipositor hardly exerted.

Type-locality.—Castle Rock, Delaware County, Pennsylvania.

Type.—Cat. No. 14738, U.S.N.M.

Labeled, "collected June 1, 1902, V. A. E. Daecke."

CHAROPSIMORPHA, new genus.

Habitus as in *Charops* Holmgren, but related to *Eriborus* (Foerster) Schmiedeknecht, from which it may be distinguished by the head receding vertically from the hind ocelli, by the lenticular head, by the antifurcal or vertical nervellus, by the petiole being without a fossa on each side near the post petiole, and by the laterally carinate, bifossulate scutellum.

Type.—*Charops tibialis* Cresson.

(CHAROPS) CHAROPSIMORPHA TIBIALIS APATURÆ (Ashmead).

Charops apaturæ Ashmead shows no tangible difference other than in color and should, at most, be treated as a race.

Genus CYMATONEURA Kriechbaumer.

Cymatoneura KRIECHBAUMER, Zeitschr. Hym. Dip., vol. 1, 1901, p. 22. Two species.

Type.—*Ophion undulatus* Gravenhorst, by present designation. Isogenotypic and synonymous with *Allocamptus* (Foerster) Thomson.

DAICTIMORPHA, new genus.

Agrees with Foerster's description of *Daictes* Foerster, but, unlike *Daictes* (Foerster) Viereck, this genus belongs to the Hemitelini. Propodeum with the longitudinal carina wanting or represented at most by striæ, basal and apical transverse carinæ salient and complete as in some Mesostenini.

Type.—*Daictimorpha peruviana*, new species.

DAICTIMORPHA PERUVIANA, new species.

Female.—Length, 4 mm.; mostly black and shining; face finely sculptured, in certain lights showing appressed silvery pubescence; clypeus mostly smooth and polished; mandibles yellow, with the apical half mostly dark; palpi yellowish; scape stramineous, faceted internally, hardly longer than thick, pedicel and first and second joints of the flagel yellowish; flagel 22-jointed, the joints not before mentioned brownish, nineteenth to twenty-first joints thicker than long, the remaining joints longer than thick; thorax black, shining and mostly finely sculptured; notauli poorly developed, not extending to the middle of the mesonotum; sternaui extending apparently three-fourths the way back on the mesopleuræ; tubercles, tegulæ, and wing base whitish; wings with a brownish tinge, veins and stigma brownish to blackish; trochanters whitish; fore and middle coxæ stramineous and whitish, rest of fore and mid legs stramineous; hind coxæ blackish, hind femora brownish, stramineous at apex; hind tibiæ and tarsi pale stramineous, with a subbasal and subapical brownish stain or rudimentary annulus; propodeum more or less finely sculptured and shining, with poorly developed plicæ and striæ; abdomen, finely sculptured, blackish and shining; first segment wider at base than thick, the sides of the petiole vertical and carinate above and below; spiracles of first segment nearer the apex than to each other; second, third, and fourth, dorsal segments with the apical edge translucent brownish; exerted portion of ovipositor approximately as long as the first segment.

Type-locality.—Department of Piura, Peru.

Type.—Cat. No. 14739, U.S.N.M.

Labeled, "reared from cotton squares July 11, C. H. T. Townsend, No. 795° 3h."

CAMPOPLEX (DIADEGMA) JAPONICUS, new species.

Answers the description for *Hyposoter chrysorrhoeae* Viereck, excepting as follows:

Male.—Length 5.5 mm.; malar line about as long as the mandibles are wide at base, anterior margin of clypeus rather arcuate outwardly, scape and pedicel blackish, edged with brown or castaneous, greatest diameter of lateral ocellus a little longer than the ocellocular line,

lateral ocellar line a little longer than greatest diameter of lateral ocellus, postocellar line a little more than one and one-half times as long as the lateral ocellar line; tegulæ black, hind tibiæ mostly honey color, with a subbasal and apical brownish stain, fore and mid coxæ honey color, proximal trochanters of fore and mid legs yellowish, of hind legs mostly blackish, all femora mostly reddish, hind coxæ black, hind tarsi almost entirely brownish, scutel rugulose, dull, costula complete, areolet trapezoidal, its petiole almost wanting, shorter than its shortest side or the side between recurrent vein and second transverse cubitus, discocubital vein with the merest trace of a branch before the middle (see fig. 1); narrowest part of petiole about one-third as wide as the postpetiole, second segment longer than wide at apex, thyridia hardly farther from the lateral edge than spiracles of the same segment and nearly again as far from the base as from the lateral edge, their greatest diameter about one-fourth as long as the second segment is wide at base, spiracle hardly as far as its own width from the lateral edge of the pigmented plate, third segment about two-thirds as long as the preceding segment, abdomen almost entirely black, plica transparent honey color to translucent brownish.

FIG. 1.—MEDIAN
AREOLAE OF
PROPODEUM OF
CAMPOPLEX
(DIADEGMA)
JAPONICUS.

Type-locality.—Japan.

Type.—Cat. No. 7258, U.S.N.M.

Labeled "Gip. Moth Laboratory 1071, June 21."

EPHIALTES DOLICHOSOMA, new species.

Female.—Length, 13.5 mm.; related to *Ephialtes planifrons* Thomson, from which it can be distinguished by the triangular, emarginate, anterior, edge of the pronotum, by the yellow margin along the upper edge of the sides of the prothorax, by the yellowish stramineous fore coxæ and fore trochanters, by the reddish upper swelling of the mesopleuræ, by the reddish scutel, by the absence of medial longitudinal carinæ on the propodeum and by the second dorsal segment being distinctly longer down the middle than wide at apex and provided with well impressed oblique furrows.

Type-locality.—Tryon, North Carolina.

Type.—Cat. No. 14740, U.S.N.M.

Labeled, "No. 3075E, Hopk. U. S., *Castanea dentata*, W. F. Fiske collector."

Genus EREMOTYLUS (Foerster) Thomson.

Eremotylus FOERSTER, Verh. Naturh. Ver. Preuss. Rheinland, vol. 25, 1868, p. 150, no species; Opusc. Ent. P. 12, p. 1193, 1868, one species.

Type.—(*Anomalon*) *Eremotylus marginatus* (Jurine) Thomson. First species included.

(ATELEUTI) KRIPTERNUS ELONGATUS (Davis).

EXERISTES NUBILIPENNIS, new species.

Female.—Length, 9.5 mm.; agrees with *Ezeristes hyalinipennis* Viereck, from which it may be separated by the darker wings, the nervellus which is broken above the middle, and the smooth, highly polished lateral aspects of the pronotum.

Type locality.—Columbia Falls, Montana.

Type.—Cat. No. 14741, U.S.N.M.

Labeled in the same way as *Ezeristes hyalinipennis* Viereck.

EXERISTES HYALINIPENNIS, new species.

Female.—Length, 9 mm.; of the European species of *Ezeristes* and allied genera or subgenera this apparently agrees best with *Ezeristes roborator* Fabricius, from the typical form of which it may be distinguished by the smooth, poorly punctured head, thorax and propodeum; by the nervellus being broken below the middle; by the reddish and blackish hind femora; by the blackish hind tibiæ with stramineous base; by the blackish hind tarsi with the base of the first segment or metatarsus stramineous; by the black vaguely punctured abdomen and by the first, dorsal segment being apparently longer down the middle than wide at apex.

Type-locality.—Columbia Falls, Montana.

Type.—Cat. No. 14742, U.S.N.M.

Labeled, "No. 8582 Hopk. U. S., from *Pissodes* species, May 10–15, 1911, Josef Brunner collector."

This species may prove to be only a mutant of *Ezeristes nubilipennis* Viereck.

FIEBRIGIA, new genus.

Head lenticular; temples along the upper fourth of the eye, as seen in profile, not extending beyond the hind edge of the eye; mesopleuræ with a distinct concavity extending obliquely from the anterior, superior edge backward and downward. Related to *Zacharops* Viereck and *Amorphota* (Foerster) Howard.

Type.—*Campoplex texanus* Ashmead.

CAMPOPLEX (HYPOTHEREUTES) EXIGUAE, new species.

Female.—Length, 5.5 mm.; related to *Hypothereutes geometræ* Ashmead, from which it may be distinguished as follows: Malar line nearly as long as mandibles are wide at base; scape and pedicel blackish; fore and mid coxæ brownish; femora reddish brown; fore and mid tarsi brownish stramineous, hind tarsi dark brown, only the basal joint pale at base, hind, proximal trochanter blackish; areola wider than long; the areopetiolarea similar in outline to the same in *Hyposoter parorgyæ* Viereck, planate, at least not appreciably con-

cave; abdomen with the apical half reddish throughout, second, dorsal segment blackish at apex.

Type-locality.—Davis, California.

Type.—Cat. No. 14743, U.S.N.M.

Labeled, "bred from *Caradrina exigua* Oct. 26, 1908, Dr. Shaw, Chittenden No. 2108^{oo}." Received from the Bureau of Entomology, United States Department of Agriculture.

Allotype.—Essentially as in the type, apical transverse carina of propodeum more developed especially between the areola and petiolarea; areola apparently longer than wide; abdomen with blackish stains dorsally on ultimate and penultimate segments.

Labeled, "Santa Ana, Calif., issued Sept. 30, 1908, bred from larva of *Caradrina exigua*, Chittenden No. 1418^{o1}." Bureau of Entomology, United States Department of Agriculture.

Genus IDECHTHIS (Foerster) Ashmead.

As represented by *Idechthis patulus*, new species, this genus is apparently related to *Nothanomalon Szepligeti* from the original description of which it differs especially in the rather cubical *Olesicampe* like head, in the noncarinate scutellum, in the propodeum not being deeply furrowed and in the second dorsal segment being little shorter than the first. In this genus as represented by *I. patulus* Viereck, the second abscissa of the discoidal vein is shorter than the third, the nervellus is angulated below the middle and antefurcal, the recurrent vein almost interstitial with the second transverse cubitus, and the propodeum areolated, with well developed costulae, and extending beyond the middle of hind coxae but not to the apex of the same.

IDECHTHIS PATULUS, new species.

Male.—Length, 11 mm.; black and shining; face rather rugulose; clypeus with its anterior edge rounded, convex, separated from the face only by the clypeal foramina, punctured; mandibles yellow, with reddish teeth and stramineous margins; palpi stramineous; scape and pedicel yellowish beneath, dark above; flagel 42-jointed, blackish; dorsulum punctured; fore and mid legs mostly yellowish or yellow; hind coxae mostly black, tipped with yellow, hind trochanters yellow, rest of hind legs dark brown, hind femora rather stramineous beneath; tegulae and wing bases yellow; wings with a brownish tinge, veins and stigma dark brown to blackish; propodeum coarsely sculptured; areola and petiolarea confluent, the latter transversely ribbed, spiracular area and second pleural area confluent, the angular area, third pleural area, and terminal half of petiolarea more or less confluent; petiole nearly cylindrical; post petiole reddish at apex, its spiracles about one-third as far from each other as from the apical margin; petiole smooth and shining, feebly punctured; post petiole

granular and with scattered punctures; second segment granular, its apical fourth reddish, the thyridia brownish; remaining segments mostly reddish, blackish down the back.

Type-locality.—San Bernardino, Paraguay.

Type.—Cat. No. 14744, U.S.N.M.

Collected by K. Fiebrig.

Genus **MACROPHION** Szepligeti.

Macrophion SZEPLIGETI, Gen. Ins., Fasc. 34, 1905, p. 32, two species.

Type.—*Macrophion ornatus* Szepligeti; by present designation.

MESOCHORUS PALLIPES Brischke. var?

Male.—Length, 3.5 mm.; occiput stramineous; third segment testaceous or stramineous except apically and laterally where it is more or less brownish, fourth and succeeding segments blackish above testaceous laterally. Otherwise as in *M. pallipes* as originally described.

Labeled, "Europe, Gip. Moth Lab. 1446, 1446 Jn."

MESOCHORUS GRACILIS Brischke. var?

Male.—Length, 2.5 mm.; predominating color blackish or stramineous; head stramineous, face sometimes tinged with reddish, stemmaticum always blackish; petiole above entirely or almost entirely black or blackish, segments beyond the second, blackish above, testaceous laterally.

Labeled, "Europe, Gip. Moth Lab. 1216 C. Ap. 25, 28, 29, May 6, from *E. chrysorrhæa*."

MESOCHORUS TRISULCATUS, new species.

Female.—Length, 4 mm.; head mostly blackish, orbits, a line across the face involving the antennal fossæ and clypeus stramineous, malar space and most of mandibles almost colorless, whitish, palpi whitish, antennæ brownish diversified with stramineous; thorax mostly black, tubercles, tegulæ, lower edge of pronotum, base of wings and nearly all of legs, stramineous, other edges of pronotum and scutellum more or less, castaneous, claws and apex of apical tarsal joint more or less fuscous, hind femora testaceous apically their tibiæ with a fuscous band at base and apex, propodeum mostly black or blackish, first and second pleural areas confluent, castaneous, the important areolation is best shown in the accompanying figure; petiole mostly black above its lateral edge, emarginate at the spiracles, postpetiole beyond the spiracles shorter than rest of petiole, nearly parallel sided and trisulcate, the dorsum and two sides each being mostly occupied by a



FIG. 2.—MEDIAN AREOLAE OF PROPODEUM IN *MESOCHORUS TRISULCATUS*.

longitudinal sulcus none of which is bounded by sharp carinæ, postpetiole entirely smooth and polished, apically with a lunate yellowish margin, second, dorsal segment trapezoidal, narrower at base than long down the middle, with a median, longitudinal, depressed area, the lateral edge of the segment elevated over the spiracle so as to form a kind of hood for the spiracles, basally with a yellowish spot on each side, otherwise mostly black except for an apical margin and a triangular, apical area which are stramineous, rest of dorsal segments stramineous with an apical fuscous band, venter stramineous, plica whitish, petiole beneath variegated, exserted portion of ovipositor shorter than the petiole.

Type-locality.—Japan.

Type.—Cat. No. 13088, U.S.N.M.

Labeled, "Gip. Moth Lab. 3056 Je. 24, Ex. (*Glyptapanteles*)."

MESOSTENUS (MESOSTENUS) VERSICOLOR, new species.

Appears to be related to *M. funebris*, *M. nubeculator*, and *M. ater*, of which later it may prove to be the female.

Female.—Length, 8.5 mm.; differs from *M. nubeculator* Giraud as originally described, as follows: Ninth joint above tipped with whitish, the next three joints entirely whitish above, head black or blackish except for the inner orbits which have a narrow pale line adjoining the eyes; tegulæ anteriorly yellow, scutel with a yellow median spot behind the middle, posterior carina of propodeum at lateral edge produced into a rounded flange, wings uniformly clear, tinged with fuscous, the veins black or blackish, fourth joint of hind tarsi yellowish at base, elsewhere brownish.

Type-locality.—Europe.

Type.—Cat. No. 13079, U.S.N.M.

Labeled, "Gip. Moth Lab. No. 1684 A."

NEOGREENEIA, new genus.

Closely related to *Nototrachys* Marshall from which it may be distinguished by the obliteration of the transverse cubitus, by the subdiscoidal vein being virtually interstitial with the median, the discoidal vein having but two abscissæ, the first and third, the second being crowded out, by the occipital carina being totally effaced in the middle and by the different habitus.

Type.—*Neogreeniea picticornis*, new species.

NEOGREENEIA PICTICORNIS, new species.

Female.—Length, 6.5 mm.; head including the occiput mostly black, smooth and polished, front medially produced into a rounded elevation near the anterior ocellus and with a short, linear, yellow, orbital mark on each side; face, except laterally, punctured, clypeus

with indistinct scattered punctures; anterior edge of the clypeus truncate, the truncature practically as long as the adjoining sides; mandibles stramineous, except the tips which are rather castaneous; scape stramineous, pedicel and first two joints of flagel brownish, rest of flagel blackish, excepting the eleventh, twelfth, and thirteenth joints, which are whitish; flagel 20-jointed, the joints longer than thick; pronotum mostly smooth, polished and castaneous, its dorsal aspect rather stramineous; prosternum stramineous with a blackish stain laterally; rest of thorax more sculptured and mostly black except the metanotum which is reddish; mesonotum finely, indistinctly punctured, the notauli represented by rather foveolate impressions; fore and mid legs mostly stramineous, hind legs mostly brownish to blackish, their coxæ with the basal half blackish, and the apical half reddish; all spurs stramineous; tegulæ stramineous; wings virtually colorless with a dark cast, stigma and veins brownish to blackish; propodeum reticulated, black except at extreme apex where it is reddish; abdomen blackish except base and apex of first segment and the membranous portions which are more or less stramineous; fourth, dorsal segment blackish at base, elsewhere rather ochreous; apex of abdomen broadly truncated, the ovipositor virtually twice as long as the truncature and rather stramineous, the sheaths blackish.

Type-locality.—Roxborough, Pennsylvania.

Type.—Cat. No. 14745, U.S.N.M.

Labeled, "collected June 19, 1909, Chas. T. Greene."

Named for Mr. Charles T. Greene.

Genus OMORGUS (Foerster), Dalla Torre.

Omorgus FOERSTER Verh. Naturh. Ver. Preuss. Rheinland, vol. 25, 1868, p. 154, no species; Cat. Hym. vol. 3, 1901, p. 114, many species.

Type.—*Limneria mutabilis* Holmgren, by present designation.

Congeneric with *Campoplex* Gravenhorst.

(GLYPTA) OXYRRHEXIS PARVUS (Cresson).

PARACANIDIA, new genus.

Related to *Bathyplectes* (Foerster) Szepligeti, from which it differs, especially in the tryphonine habitus, in the laterally carinate scutellum, and in the nervellus being broken, the break existing distinctly below the middle, being very near the lower end.

Szepligeti in his gruppe Mesochoroidæ in the genera Insectorum, fasc. 114, 1911, makes *Bathyplectes* Foerster synonymous with the preoccupied *Canidia* Holmgren. Of the many species included in the place just cited, I choose *Canidia exigua* Gravenhorst as the type for *Bathyplectes* Foerster, making the latter genus isogenotypic with the former. As *Bathyplectes* Foerster is now definitely established and

synonymous with *Canidia* Holmgren, it will replace the latter pre-occupied name, in place of *Canidiella* Ashmead.

Regarded as a *Mesoleptine* this would be allied to *Euryproctus* Holmgren.

Type.—*Paracanidia elyi*, new species.

PARACANIDIA ELYI, new species.

Female.—Length, 8 mm.; superficially this recalls *Callidora annellata* Thomson, compared with which it differs chiefly in the better developed head, which is somewhat intermediate between transverse and cubical, the distance between the hind ocelli being apparently half the distance between the lateral ocelli and the occipital carina, in the clypeus, which is nearly three times as wide as long down the middle, highly polished, and truncated anteriorly, the truncature apparently as wide as the clypeus is long down the middle; in the annulus of the flagel, which completely involves joints 10, 11, 12, and 13, partly involves joint 9, and almost entirely covers joint 14; in the clypeus, which is dark brown, becoming castaneous along the apical edge; in the mandibles, which are brownish stramineous with tips and base blackish; in each of the third, fourth, and fifth joints of the maxillary palpi being longer than the longest joint of the maxillary palpi in *C. annellata* Thomson, cylindrical and equal or nearly equal to each other in length; in the mesopleuræ showing a better suggestion of sternaui at the prepectal carina; in the more completely carinated, rather compressed scutel; in the interstitial nervulus, in the broken nervellus, in the sessile areolet; in the rather elongate hind coxæ, which are obviously longer than the greatest length of the metapleuræ; in the brownish stramineous wing base and tegulæ, in the brownish stramineous, brownish and blackish fore and mid coxæ, in the blackish hind coxæ, which are streaked with reddish, in the mostly whitish proximal trochanters, in the stramineous to brownish distal trochanters, in the blackish femora, hind tibiæ and hind tarsi, in the brownish stramineous to brownish fore and mid-tibiæ, in the brownish fore and mid-tarsi; in the propodeum not extending apparently as far as the end of the basal third of the hind coxæ, not being channelled nor so coarsely sculptured, with an acute-angled basal area with rather weak circumscribing carinæ, the basal area apparently two-thirds the length of the open areola, the areola apparently two-thirds the length of the petiolarea, middle and lateral longitudinal areas mostly completely separated from each other and the median longitudinal areas, the apical transverse carina developed on each side at the middle of the petiolarea into a rather prominent lamella; in the mostly polished abdomen with petiole not bulbous at apex, but gradually dilated, the spiracles a little beyond the middle, hardly carinate, with a median longitudinal furrow on the apical half

of the dorsum; in the spiracles of the second segment being before the middle and at the end of a lateral furrow, apical fourth of second, dorsal segment reddish, third, dorsal segment, with nearly all of apical two-thirds reddish, abdomen from the end of the third segment sub-cylindrical and blackish with pale margins, hypopygium apparently a little longer than the pygidium, ovipositor barely exerted from between two sheet-like sheaths that are apparently as broad as half of the vertical diameter of the sixth segment, rounded at apex and translucent brown.

Type-locality.—East River, Connecticut.

Type.—Cat. No. 14746, U. S. N. M.

Labeled, "collected July, 1910, by Dr. Chas. B. Ely."

(MESOCHORUS) PLECTISCUS PATULUS (Viereck).

(MESOSTENUS) POLYCYRTUS ALBOMACULATUS (Cresson).

(PHYGADEUON) POLYRHEMBIA POLITA (Viereck).

PSEUDOCASINARIA, new genus.

Related to *Amorphota* (Foerster) Howard, from which it may be distinguished by the slit-like propodeal spiracles, the apparent absence of clypeal foramina, and in having the second abscissa of the discoidal vein distinctly shorter than the third.

Type.—*Casinaria americana* Ashmead.

(ANGITIA) SAGARITIS WEBSTERI (Viereck).

SESIOPLEX, new subgenus.

Related to *Campoplex* Gravenhorst, from which it may be distinguished by the depressed first abdominal segment, the petiole of which is distinctly wider than thick dorso-ventrally, while the post-petiole is flattened, not at all bulbous.

Type.—*Campoplex* (*Sesioplex*) *depressus*, new species.

Female.—Length, 5.5 mm.; scape black throughout; tibiae mostly yellowish, the hind pair colored after the same pattern as in *Campoplex caradrinæ* Viereck, hind tarsi fuscous, first, second, and third joints yellowish at base, otherwise agreeing closely with the original description of (*Limneria*) *Campoplex dimidiatus* (Cresson).

Type-locality.—Louisiana.

Labeled, "parasite on *Gelechia gallaesolidaginis*, March 25, 1887, F. M. Webster." Cocoon 7 by 2 mm., rather cylindrical, rounded off at the ends, parchment-like in texture, with some loose silk over the cocoon proper, which is brownish in color.

STILPUS ANTHOMYIDIPERDA, new species.

Female.—Length, 3.5 mm.; flagel 14-jointed; closely resembles *Stilpnus gagates* Gravenhorst, from which it may be distinguished by the first three joints of the antennæ being dark brown, the remain-

ing joints blackish, by the dark castaneous tegulæ, by the faint outer vein of the areolet, by the inner carinæ of the postpetiole converging toward the apex and by the bulbous abdomen.

Type-locality.—Clarksville, Tennessee.

Type.—Cat. No. 14747, U.S.N.M.

In the allotype the flagel is 17-jointed and the abdomen depressed, otherwise essentially as in the type.

A male paratype has the tegulæ rather stramineous.

Labeled, "reared April 26, 29, 1911, from Anthomyids on tobacco, S. E. Crumb."

(MESOLEPTUS?) *THYSIOTORUS PEREGRINUS* (Cresson).

Type-locality.—New Jersey.

(GLYPTA) *TOXOPHOROIDES ALBOMARGINATA* (Cresson).

TRACHICHNEUMON, new genus.

Related to *Stenichneumon* Thomson, from which it can be distinguished by the hypopygium, being as long as or longer than the preceding segment, in the rounded nonangulate junction between the petiole and postpetiole, in the prominently exerted sheaths of the ovipositor and in the *Hoplismenus* like habitus.

Type.—*Ichneumon confirmatus* Cresson.

TRICHOMMA EPISCHNIE, new species.

Nervellus broken distinctly below the middle.

Female.—Length, 11.5 mm.; differs from the original description of *T. reticulatum* Davis, as follows: Ferruginous; interocellar area, middle of pronotum and anterior edge of dorsulum blackish; notauli represented by a rather wrinkled area; scutel convex, with a carina on each side; apical third of hind tibiæ blackish; wings yellowish with a dark tinge; abdomen paler than the thorax, the second, dorsal segment blackish above; ovipositor 4 mm. long.

Type-locality.—Crows Landing, California.

Type.—Cat. No. 14748, U.S.N.M.

Labeled, "bred from No. 2109^{os} *Epischnia granitella* Rag., Dec. 21, 1911, F. A. Hyde collector." Received through the Bureau of Entomology, United States Department of Agriculture, from F. H. Chittenden.

TRICHOMMA GRANITELLE, new species.

Nervellus broken distinctly below the middle.

Male.—Length, 12.5 mm.; differs from the original description of *T. reticulatum* Davis, as follows: Black; face, most of orbits and mouth parts, reddish; legs more or less reddish, the fore and mid legs pale, coxæ more or less black, hind tibiæ with apical third blackish; abdomen reddish, except dorsum of second, dorsal segment, apical

third of fifth, dorsal segment and all of the following, dorsal segments mostly blackish; otherwise virtually as in the preceding species.

Type-locality.—Crows Landing, California.

Type.—Cat. No. 14749, U.S.N.M.

Labeled the same as *T. epischniæ* Viereck and received through the same channels.

This may prove to be the male of the preceding species.

XYLOPHRURIDEA, new genus.

Agrees with Schmiedeknecht's definition of *Xylophrurus* (Foerster) Schmiedeknecht as given in Genera Insectorum, except that the mandibles are not gibbose at base, in the short parapsidal furrows which are indicated only anteriorly, and in the round propodeal spiracles. The sternauli in this genus are very poorly defined so that this might be taken to be a Pimpline were it not for the traces of Cryptine sternauli and the Cryptine habitus.

Type.—*Xylophruridea agrili*, new species.

Female.—Length, 8 mm.; flagel 20-jointed; body including most appendages black or blackish, wings mostly, almost colorless, tinged with brown, with a brownish, substigmal band and brownish tips, veins brownish and blackish, stigma blackish; basal, transverse carina present, other carinæ virtually wanting, the median, longitudinal carinæ somewhat represented between the basal, transverse carina and base of propodeum, making an ill circumscribed basal area; exerted portion of ovipositor hardly half as long as the abdomen.

Type-locality.—French Creek, West Virginia.

Type.—Cat. No. 14750, U.S.N.M.

The allotype is essentially as in the type except in the 25-jointed flagel.

Labeled, "reared from *Agrilus vittaticollis*, Quaintance No. 7518; 7524, issued April, 1912;" Bureau of Entomology, United States Department of Agriculture; F. E. Brooks, collector. A female paratopotype has a whitish annulus to the antennæ.

ZACHAROPS, new genus.

Propodeum extending beyond the middle but not to the end of hind coxæ; second segment not longer than the first; distance between hind ocelli and occipital carina greater than the distance between hind ocelli; hind edge of mesosternum without a process on each side of mesolcus; areolet wanting; nervellus postfurcal, not broken but angulate nearly in or above the middle; second abscissa of discoidal vein as long as or shorter than the third; head lenticular, vertically receding behind lateral ocelli.

Related to *Amorphota* (Foerster) Howard.

Type.—*Charops annulipes* Ashmead.

Genus ZACHRESTA (Foerster) Woldstedt.

Zachresta FOERSTER, Verh. Naturh. Ver. Preuss Rheinland, vol. 25, 1868, p. 151, no species.; Bull. Acad. Sci. St. Petersburg, vol. 23, 1877, p. 436 (separate), one species.

Type.—*Zachresta insignis* Woldstedt. First species included.

As represented by *Zachresta popoffensis* Ashmead, this genus agrees with characters in bold face type in the description of *Benjaminia* Viereck given on page 633 of this paper, but differs in the distance between hind ocelli and occipital carina, being equal to or distinctly less than the distance between the hind ocelli; in having an areolet which receives the recurrent vein beyond the middle and in the spiracles of the first dorsal segment being nearer to each other than to the apex.

ZAMANSA, new genus.

In having the radial side of the areolet longer than the cubital side this genus may be said to resemble *Mansa* Tosquinet, the propodeum is not sulcate however as in *Mansa* and has a basal transverse carina as well as a lamella on each side representing the apical transverse carina; spiracles of first abdominal segment nearer to each other than to the apex, postpetiole with a smooth, shallow furrow on its anterior half; frontal basin bounded laterally by a prominent carina that terminates above nearly as far from a lateral ocellus as the latter is to its fellow; thirteenth and most following joints of antennæ broader than long.

Type.—*Cryptus aztecus* Cresson.

ZASTERNAULAX, new genus.

Apparently related to *Idioxenus* Foerster, from which as represented by *I. variator* Foerster it can readily be distinguished by the complete sternauli, by the propodeum being longer than the hind coxæ and by the simple antennæ in the male.

Type.—*Zasternaulax simplicicornis*, new species.

ZASTERNAULAX SIMPLICICORNIS, new species.

Male.—Length, 4.25 mm.; black; clypeus blackish at base, transversely impressed and brownish beyond; mandibles and palpi stramineous, the former with blackish tips to the teeth; malar line approximately half as long as the mandibles are wide at base; antennæ brownish; flagel 26-jointed, all joints longer than thick and cylindrical, excepting the apical joint, which is conical, the first joint a little shorter than the second; tegulæ stramineous; wing base yellowish; wings almost colorless, stigma blackish, most veins dark brown to blackish; legs yellowish, onychium and penultimate tarsal joint brownish, hind coxæ mostly blackish; areola extending nearly two-

thirds the length of the propodeum, almost from the base to the petiolarea as a parallel sided area apparently eight times as long as wide; petiolarea nearly as wide as long and circumscribed by a distinct carina; petiole parallel sided, planate, aciculate and apparently twice as long as the smooth postpetiole; second, dorsal segment rather stramineous and compressed apically, third, dorsal segment compressed basally and rather stramineous apically, fourth segment somewhat stramineous apically; ventral segments stramineous along the sutures.

Type-locality.—Columbia Falls, Montana.

Type.—Cat. No. 14751, U.S.N.M

Labeled, "No. 8574 Hopk. U. S., from *Pissodes* species; Josef Brunner, collector."

MODEL OF A BRAHMIN TEMPLE.

FOR DESCRIPTION SEE PAGE 649.

MODEL OF A BRAHMIN TEMPLE.

By IMMANUEL M. CASANOWICZ,
Of the United States National Museum.

Made of the bleached pith of the cork tree, each piece having been cut with a knife and glued to its place.

The temple proper is a square structure standing on a platform and surrounded on all sides by a pillared porch or arcade. Inside the shrine is divided into two chambers; the front is to hold an altar upon which the offerings of the worshipers are deposited, and the rear which is to be occupied by the image or symbol of the deity. The shrine is surmounted by a bower, likewise square in plan, rising in three stories, and crowned with a bulbous dome, set at either end between an open lotus, the sacred flower of India. The whole terminates in a pinnacle in form of a graceful vase reversed. The tower as well as the balustrade surrounding it are richly carved. In front of the sanctuary is a large court inclosed by a colonnade, the entrance to which is surmounted by an oblong truncated pyramid. The court as well as the platform of the shrine rest on another broad terrace. Steps on all four sides lead up both terraces to the court and porch of the temple. Inside the court and all around outside on the lower platform are placed vases holding flowers and shrubs, while at the corners in front of the court stand betelnut palms.

Mr. W. E. De Riemer, who obtained the model in the Madura district of the Madras Presidency, South India, and for many years lived in India, thinks that, while it was made from a particular temple, it fairly represents the general type of a Hindu temple devoted to the service of Siva in southern India.

Architecture is the dominant art of India; sculpture and painting have been chiefly developed as accessories to it. As India is "the land of religions," and the life of its people is in all its aspects governed by religious motives, its art is essentially religious and associated with buildings dedicated to the service of religion.

None of the architectural and sculptural monuments of importance which survive in India antedates the third century B. C. In the early architecture of India wood was almost exclusively employed.

It was about the middle of the third century B. C. that the Buddhists, under King Asoka, who had raised Buddhism to the position of State religion in India, introduced stone as building material for important structures. Many features of Hindu architecture point to the general previous use of wood, being to a large extent imitations of wooden models.

There does not seem to be any fundamental distinction, from the point of view of art, between a temple devoted to the worship of Vishnu or to that of Siva—the two chief gods of the Hindu population. It is only by observing the images or emblems worshiped, or by reading the mythological stories represented in the sculptures with which the temple is adorned, that the deity to whom it is dedicated can be determined.

The essential part of every temple is the shrine or cell called *vimana*, in which dwells the god with the attendant priest, and the vestibule (*antarala*), which receives the worshipers, with a preceding porch (*jagamahan*). This actual temple is not always the principal element in the composition. It is very often of small dimensions and is overshadowed by the subsidiary parts, such as courts, gateways, tanks, dwellings for the priests, and numerous other buildings designed for the convenience of the pilgrims, or for the purpose of producing the impression of mass and dignity. The Hindu temple is not designed to serve as a meeting place of worshipers for the recital of common prayers, or the performance of a public ritual. The Brahmin cult is not congregational, but individual. The worshiper walks round the temple a set number of times, always with his right side next to it, then enters the front chamber, rings a bell to call the attention of the god, presents his offerings of flowers, fruit, rice, etc., either makes a prostration or raises his hands to his forehead, mutters his inaudible short prayer, gets a glimpse of the god, and leaves.

The general characteristics more or less common to all Hindu styles are the pyramidal stepping of the dominant parts and the placing of temples on platforms or terraces, features which may have been borrowed from Babylonia by way of Persia. The dome is horizontal, taking a form more or less conical or pointed, and its decoration is usually likewise horizontal; that is, the ornaments are ranged in concentric rings, one above the other, instead of being disposed in vertical ribs as in Roman or Gothic vaults. The same motive, moreover, is often indefinitely repeated, representing, as it were, miniatures of the tower or some other part which it decorates. To these features may be added a predilection for minute and profuse ornament, consisting almost exclusively of sculpture and carving. "What the Hindu architect craved for," says Ferguson,¹ the

¹ James Ferguson, *History of Indian and Eastern Architecture*, revised and edited with additions by James Burgess and R. Phene Spiers, London, 1910, p. 352.

great authority on the architecture of India, "was a place to display his powers of ornamentation, and he thought he accomplished all his art demanded when he covered every part of a building with the most elaborate and most difficult designs he could invent." The differences either in form or plan of Hindu temples, as illustrated by extant buildings, answer rather geographical and racial divisions than variations of creed, and there are accordingly distinguished three leading styles:

1. The northern, in vogue in the vast region between the Himalayan and Vindhyan Mountains. It is also called the Indo-Aryan style, because in those parts of India the people are generally known as Aryans and speak dialects derived from the Sanskrit language.

2. The Chalukyan style, so called after the dynasty which reigned from the sixth to the tenth century A. D. over most of the Dekkan. It is therefore also called the Dekkan style, and is applied to the architecture of the broad zone between the Narbadda and Kistnah Rivers in Central India.

3. The Dravidian style, in southern India, the territory nearly identical with the Madras Presidency, which is inhabited by peoples speaking Dravidian tongues.

1. The northern or Indo-Aryan style. Its main characteristic is the bulging curved tower over the shrine, tapering upward and crowned with the *amalaka*, so called from its supposed resemblance to a fruit of that name (*Phyllanthus emblica*), but which appears more like a melon or large gourd (as seen in the dome of the model). The square plan of the shrine is often rendered slightly cruciform by the addition of slender rectangular projections in the center of each façade. This style, in one variety or another, has prevailed in North India from the sixth century A. D. to the present. The finest examples are assigned to the period between 950 and 1200 A. D., and the temple of Bhuvaneswar in Orissa, dating from 650 A. D., is considered one of the landmarks of this style.

2. The Chalukyan style. The shrine is polygonal, star shaped in plan with stepped conical, rather low roof and vaselike ornament crowning the summit. Sometimes two or even three shrines are grouped round a central hall and connected by a common porch. "The Chalukyan temples," says Ferguson, "are throughout the most elegant forms of Hindu art, and those which will best stand comparison with European examples."¹ Nothing surpasses the richness and elegance of the decoration of the Chalukyan temples. The most magnificent example of the Chalukyan style is the temple of Hullabid in Mysore, dating from the thirteenth century A. D. though, owing to the upheaval of the Mohammedan invasion in 1310 A. D., it remained unfinished. It is a double temple, dedicated

¹ James Ferguson, *History of Architecture in all Countries*, vol. 2, p. 548. London, 1867.

to Vishnu and Siva, respectively. Its dimensions may roughly be stated as 200 feet square all over, including the subsidiary extension, while the temple proper is 160 by 122 feet. It is constructed of indurated potstone of volcanic origin, and stands on a terrace, 6 feet in height, and paved with large slabs. On the base of the building is a frieze 710 feet in length,¹ adorned with 2,000 elephants, most of them with riders and trappings. Above them is a frieze of *sardalas* or conventional lions. Then comes a scroll pattern of great beauty. Over which is a bas-relief with scenes and incidents from the Ramayana epic. Then comes celestial beasts and birds, with groups from human life. Then a cornice with a rail divided into panels, each containing two figures. Over this, to the right and left, are windows formed by elaborately pierced slabs, while the center is occupied by a frieze 5 feet 6 inches high and 400 feet long, depicting repeatedly the incarnations of Vishnu, dancing girls, Siva with his consort Parvati upon his knees and Brahma, the third member of the great Brahmin triad or *trimurti* of gods.

3. The Dravidian style. The temples of this style are the largest and the most numerous in India. "The Dravidian is the most extensive style. There are perhaps more cubic feet of masonry in buildings of this style than of all the other styles of India put together."² This is perhaps due to the circumstance that the iconoclastic zeal of the Mohammedans did not overwhelm the south to the same extent as the other parts of India. The shrine of a Dravidian temple is square in plan and decorated with pilasters and niches. The tower surmounting it is pyramidal and always stepped or storied, terminating in a small dome. Preceding the door leading to the shrine is a hall, *mantapa*, or two such. The temple invariably stands within a rectangular inclosure with great pyramidal gateways, called *gopuras*. These *gopuras* are in general design like the towers over the shrine, excepting that they are twice as wide as deep, forming a truncated pyramid (like that of the model). Frequently they are more imposing than the temples themselves. Some temples have several such inclosures, each with its gateways. Another distinguishing feature of the Dravidian temple is the pillared halls, called *choultries*, which occupy the spaces between the various inclosures. They range in size from a small pavilion on four columns to a magnificent "hall of a thousand pillars." These pillars are often of close-knit granite and covered with sculptures from base to capital in a way that in most instances no two are exactly alike. These halls serve various purposes, as porches for the convenience of pilgrims, halls of ceremony, etc.

¹ The frieze of the Parthenon is not quite 525 feet long.

² History of Architecture in all Countries, vol. 2, p. 548.

The temple at Tanjore, in Mysore, is considered as the oldest and best preserved example of Dravidian art. It probably belongs to the tenth century A. D., and was dedicated to Siva. It stands in a courtyard of 500 by 250 feet. The base of the shrine is 82 feet square, and is in two stories. Above this rises the pyramidal tower through 13 stories to a height of 190 feet, crowned with a dome said to consist of a single stone. But for vastness of dimensions it is surpassed by the unfinished Vishnu temple at Seringam, near Trichinopoly. It stands with its gilded dome, holding an image of the god, in the center of 7 inclosures, which are crowned with 16 gate pyramids. The outer inclosure extends 2,865 by 2,520 feet. The great pillared hall measures 500 by 138 feet, resting on 953 columns, each of a single block of granite and all carved more or less elaborately.

While the pyramidal tower recalls the terraced temple towers of Babylonia (a model of which is likewise in the United States National Museum), the pyramidal gateways, or gopuras, suggest the pylons, or doorways with their massive towers which led to the forecourt of the Egyptian temples, and the hall of columns, or choultrie, answers the Egyptian hypostyle hall, so called from its covered colonnade which, like its Hindu counterpart, was used for processions and other ceremonies, and behind which stood the small shrine in which the god dwelt.

NOTE ON THE GENERIC NAME SAFOLE, REPLACING BOULENGERINA, FOR A GENUS OF KUHLLIID FISHES.

By DAVID STARR JORDAN,
Of Stanford University, California.

In our recent paper on the Sparoid fishes of Japan¹ Jordan and Thompson have adopted the generic name *Boulengerina* Fowler² for the genus which contains the marine *Kuhliidæ*. Dr. Leonhard Stejneger calls my attention to the fact that the name *Boulengerina* was applied by Dr. Louis Dollo³ to a genus of snakes. The genus of fishes is thus left without a name. It may be called *Safole*. This is the vernacular name in Samoa of *Safole tæniura*, which species (*Dules tæniurus* Cuvier and Valenciennes) may be taken as the type of the genus.

Safole, in Samoan, corresponds to the Hawaiian name Ahole-hole, applied to *Safole sandvicensis*.

¹ Proc. U. S. Nat. Mus., vol. 41, 1912, p. 522.

² Proc. Acad. Nat. Sci. Phila., 1906, p. 512.

³ Bull. Mus. Roy. Nat. Hist. Belgique, vol. 4, 1886, p. 150.

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